TM 11-4057

WAR DEPARTMENT TECHNICAL MANUAL

RADIO TRANSMITTER

BC-610-A,-B,-C,-D and E

REPAIR INSTRUCTIONS

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WAR DEPARTMENT • DECEMBER 1945

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TM 11–4057, Radio Transmitter BC–610–A, –B, –C, –D, and –E, Repair Instructions, is published for the information and guidance of all concerned.

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Refer to FM 21–6 for explanation of distribution formula.

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SAFETY NOTICE

This equipment employs HIGH VOLTAGES which are DANGEROUS TO LIFE. Electrical interlock switches are provided for your protection. They remove the high d-c voltage to the output circuits in the transmitter, when the hinged doors of the cover are open or when either the cover or the back is removed. Always be sure that back, cover, and cover doors are closed BEFORE APPLYING PLATE POWER.

When the transmitter is in operation EXTREMELY HIGH R–F VOLTAGES are present in and around the antenna tuning unit, all its connecting leads, the antenna and the antenna insulator. You can get DANGEROUS BURNS from arcs caused by touching the ANTENNA CIRCUIT. BE CAREFUL! Do not attempt to make an adjustment unless you are thoroughly familiar with this equipment.

SECTION I

DESCRIPTION OF RADIO TRANSMITTERS BC–610–A, –B, –C, –D AND –E*

1. General

This manual provides repair procedure for Radio Transmitters BC–610–A, –B, –C, and –D of Radio Sets SCR–299–( ); and Radio Transmitter BC–610–E of Radio Set SCR–399–A, and SCR–499–A. Official nomeclature followed by (*) is used to indicate all models of the item of equipment included in this Technical Manual. The full type num-

*See TM 11-281 for installation, operation, and other maintenance data on this equipment.

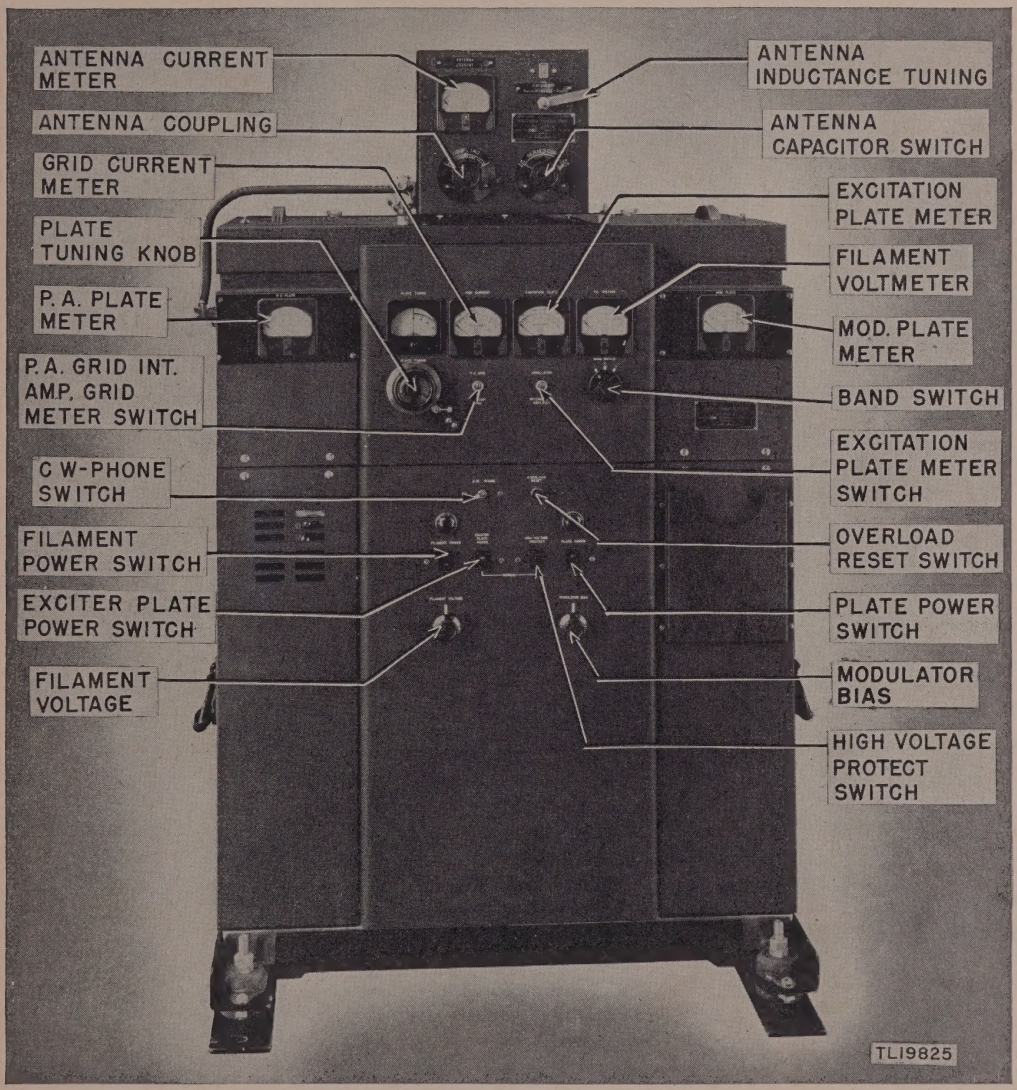


Figure 1. Radio Transmitter BC–610–A, –B, and –C with Antenna Tuning Unit BC–729–(*), front view.

ber is used only when particular models must be identified. Thus Radio Transmitter BC–610–(*) represents Radio Transmitters BC–610–A, –B, –C, –D, and –E.

2. Operating Accessories

These transmitters are designed for vehicular, portable, or fixed operation. Radio Transmitters BC–610–A through –D are primarily installed in

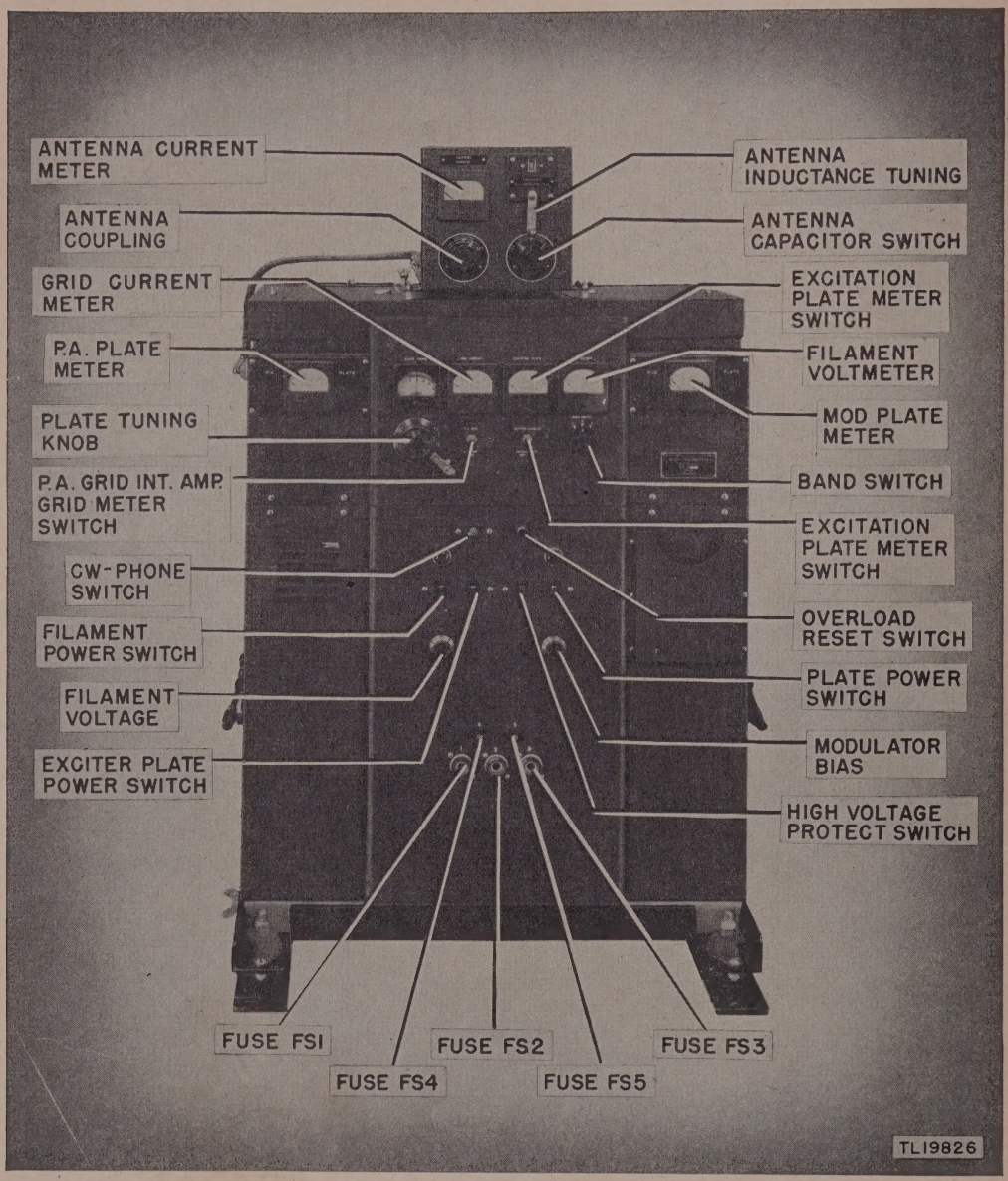


Figure 2. Radio Transmitter BC–610–D with Antenna Tuning Unit BC–729–(*), front view.

a 1½-ton Truck K–51–( ); Radio Transmitter BC–610–E is installed in Shelter HO–17–( ). They are equipped with the following accessories:

a. Power Unit PE–95–( ). These transmitters are equipped with mobile generating unit which is installed in Truck K–52–( ), but they may be operated from a commercial power source.

b. Antenna-tuning Units. Radio Transmitters BC–610–A through –D are equipped with Antenna Tuning Units BC–729–( ); model BC–610 –E is equipped with Antenna Tuning Unit BC–939–A. These tuning units are mounted on top of, and are connected to, the transmitters to match their output to the antenna. (See figs. 1, 2, and 3.)

c. Speech Amplifier BC–614–( ). Voice trans-

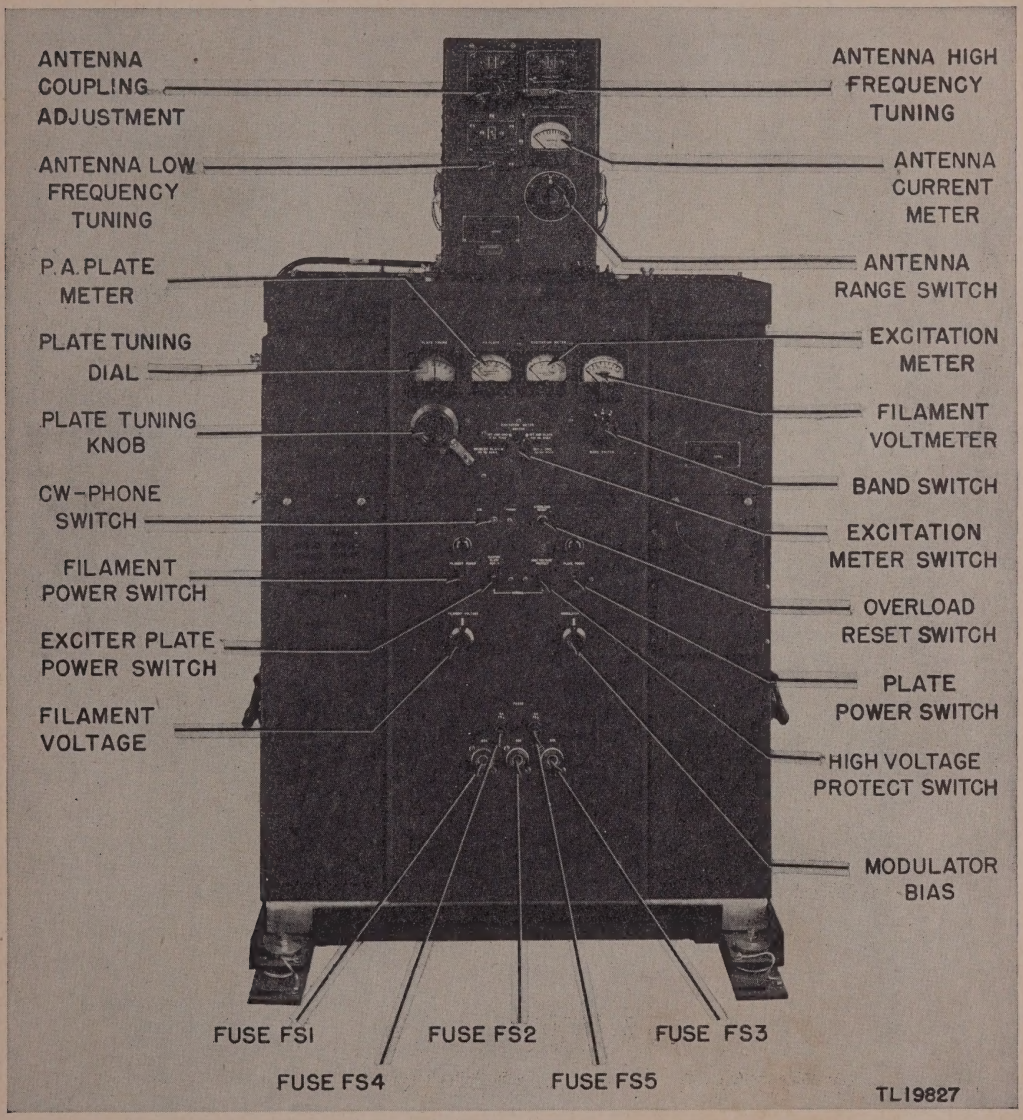


Figure 3. Radio Transmitter BC–610–E with Antenna Tuning Unit BC–939–A, front view.

mission involves the use of Speech Amplifier BC–614–( ).

d. Junction Box JB–70–A. The transmitter control switch for model BC–610–E is located on Junction Box JB–70–A. For the other models this switch is on Speech Amplifier BC–614–( ).

3. Electrical Characteristics

a. Operating Range. The normal operating range with any other Radio Set SCR–299–( ), SCR–399–( ), or SCR–499–( ) for two-way voice communication is 100 miles. The use of continuous–wave (c–w) transmission will increase the range to 250 miles or more, depending upon the frequencies chosen and the time of day or year.

b. Frequency Range. The frequency range for Radio Transmitters BC–610–A through –D is from 2 to 8 megacycles (mc). See section II, for differerences in models. The frequency range for model BC–610–E is from 2 to 18 mc. Provision is made for plugging in tuning units to accomplish transmission at various frequencies.

c. Frequency Control. Frequency control is maintained by master oscillator or by crystal, and selection is made by switch (M.O.–XTAL) which is on each tuning unit.

d. Type of Transmission. These Transmitters are designed to send continuous–wave (c–w) or voice signals using amplitude modulation.

e. Power Input. The transmitter power requirements are 1700 to 2000 watts, 115 volts, 50–60 cycles a–c. Radio Transmitter BC–610–E requires 117 volts.

f. Power Output. Power output of the transmitters exceeds 400 watts when on continuous wave and 300 watts when on voice.

4. Transmitter Assembly

Radio Transmitters BC–610–(*) are ruggedly built, similar in appearance, and identical in size. They all weigh 401½ lbs, excluding the shock mount base which weighs 51 lbs. The assembly is composed of the following sections:

a. Upper Chassis. The upper chassis includes the radio-frequency components, filament supply for the radio-frequency tubes, plug-in tuning units, and all indicating instruments. (See figs. 4, 5, 9, and 10.)

b. Center Chassis. The center chassis contains all of the audio and modulator sections which are not included in Speech Amplifier BC–614–( ). Also included on this chassis are power supplies for the bias and audio driver circuits as well as the plate transformer for the exciter plate voltage rectifier. (See figs. 11 and 12.)

c. Lower Chassis. The lower chassis includes the complete high-voltage power supply together with its overload relay. This chassis is bolted by large wing bolts to the shock-mounting cradle which holds the transmitter to the floor. (See figs. 14 and 15.)

d. Front Panel. On the upper part of the front panel are mounted the varous meters and switches. On the lower section are mounted switches for handling power application, the CW - PHONE switch, a reset switch for the overload relay, and controls for setting the filament voltage and the modulator bias. In addition to these controls, Radio Transmitters BC–610–D and BC–610–E have all of their fuses mounted on this panel. (See figs. 1, 2 and 3.)

5. Over-All System Function

Radio Transmitter BC–610–(*) is equipped with a circuit consisting of a radio-frequency (r-f) section, a modulator section, and a high-voltage power supply. The r-f section consists of the oscillator, the doubler or buffer stage, the intermedi-

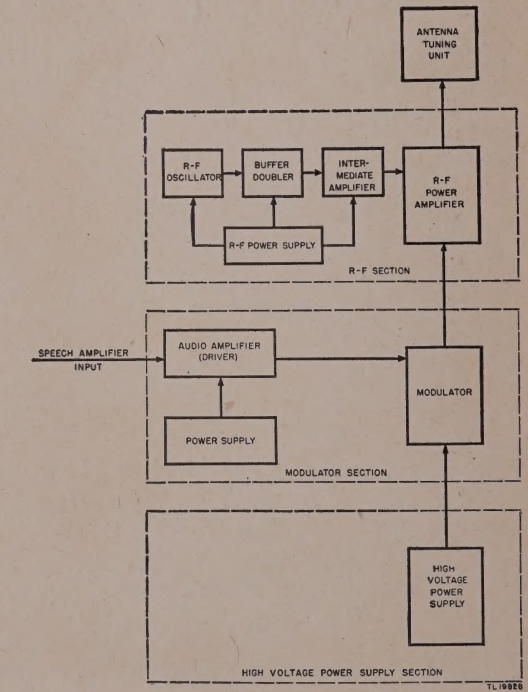


Figure 4. Radio Transmitter BC–610–(*), block diagram.

ate-amplifier stage, and power amplifier stage. From the power amplifier the signal is delivered to the antenna-tuning unit. As an alternative to the adjustable master oscillator, frequency control may be had by plugging a crystal into the jack on the tuning unit. The radio-frequency (r-f) section is equipped with a power supply which feeds voltage to the oscillator, doubler-buffer, and driver tubes. The modulator section consists of two audio power amplifier stages: the audio driver which operates in a push-pull class A audio power amplifier circuit, and the modulator which operates in a push-pull class B amplifier circuit. The modulator tubes are biased near cut-off. The modulator section has a power supply to feed the audio driver tubes. The high-voltage power supply section rectifies the direct current (d-c) power input, and converts it to high-voltage d-c power to supply plate voltage to the modulator tubes and the r-f power amplifier tube. Figure 6 is a block diagram which shows the various stages of the transmitter.

Figure 5. Radio Transmitter BC–610–A, –B, and –C, rear view.

Figure 6. Radio Transmitter BC–610–D, rear view.

6. Condensed Circuit Analysis

a. Master Oscillator or Crystal Control. Oscillator Tube JAN–6V6GT (V8) (VT–107), (figs. 40, 41, 42, and 43) generates an alternating current at a radio frequency and holds this frequency constant. The radio frequency is determined by the circuit inductance and capacity which are manually controlled. If crystal control is used, the crystal will determine the frequency generated by the oscillator.

b. C-w Transmission. In c-w transmission, the operation of the telegraph key, which is connected in series with the cathode circuit of oscillator Tube JAN–6V6GT (V8) (VT–107–A), makes and breaks the generation of oscillation and provides the telegraph transmission. The doubler or buffer Tube JAN–6L6 (V9) (VT–115), is either tuned to the same frequency or to a multiple of the master-oscillator circuit; thus it prevents the succeeding stages from affecting the oscillator. The r-f signal is fed from tube V9 to the intermediate-amplifier Tubes JAN–807 (V10 and V11) (VT–100), which provide amplification. Tube JAN–250TH (V16) (VT–220) functions as a neutralized class C power amplifier since all tubes except the oscillator are bias beyond cut-off. With the key up, these tubes become inoperative. Finally the r-f output is taken from the plate tank circuit, and fed to the antenna-tuning unit.

c. Voice Transmission. In voice transmission, the modulator section is utilized. The audio-frequency (a-f) speech signal from Speech Amplifier BC–614–( ) enters the transmitter at socket PL5 on Radio Transmitters BC–610–A through –D (figs. 40, 41, and 42), or at socket SO5 on Radio Transmitter BC–610–E (fig. 43), and is amplified in voltage in the coupling transformer. Audio driver tubes JAN–2A3 (V1 and V2) (VT–95) operate as push-pull class A audio power amplifiers. From these tubes the signal is delivered to modulator Tubes JAN–100TH (V3 and V4) (VT–218), which provide further amplification. The resultant a-f signal is fed in series into the high-voltage plate power supply of Tube JAN–250TH (V16) (VT–220) thus modulating the r-f output. The presence of the a-f signal in the plate circuit of power-amplifier (p-a) tube V16 causes a proportional fluctuation in the plate voltage of this tube and varies the output of the radio transmitter correspondingly. In this manner, the r-f carrier is amplitude-modulated. The modulated signal is fed from coupling transformer L5 to the antenna-tuning unit. For detailed functioning of circuits, see TM 11–280 and TM 11–281.

SECTION II

DIFFERENCES BETWEEN MODELS

7. General

It is advisable for all servicing personnel to become thoroughly familiar with the differences between the various models. For a detailed description of the stage circuits, see section VIII. Parts and part numbers on the schematic diagrams differ, and in some cases the electrical values of the parts vary. For this information consult the four over-all schematic diagrams (figs. 42, 43, 44, and 45) and the various stage diagrams with their individual parts lists. The following tables show the external and operating differences between models. In the first column Radio Transmitters BC–610–A through –D (figs. 42, 43, and 44) are considered as a group, with the differences which exist within this group being indicated. In the second column, Radio Transmitter BC–610–E (fig. 45) is treated as an individual set.

8. External Differences

Table I, which follows, indicates the external differences between models of Radio Transmitter BC–610–(*).

Table I. External Differences Between Models

Part	Radio Transmitter BC–610–(*)	
Meters	ABCD	E
	M1 is a grid current indicator (See par. 9.)	M1 is a current indicator (See par. 9.)
	M2 is a plate current indicator (See par. 9.)	M2 is a p-a plate current indicator.
	M3 is a filament voltage meter.	M3 is a filament voltage meter.
	M4 is a modulator plate meter.	M4 is an antenna current indicator. (See fig. 3.) (See par. 9.)
	M5 is a p-a plate meter.	
	M6 is an antenna current indicator (See figs. 1, and 2.) (See par. 9.)	
Fuses	ABC	E
	FS1, FS2, FS3, FS4, and FS5 are located on the back of the chassis of the modulator section. (See fig. 1.)	FS1, FS2, FS3, FS4, and FS5 are located on the lower section of the front panel. (See fig. 3.)
	D	
	These fuses are located on the lower section of the front panel. (See fig. 2.)	
Switches	ABCD	E
	Switch SW9 controls meter M2.	Switch SW9 is omitted.
	Principal switch for transmitter control is on Speech Amplifier BC–614–( ).	Principal switch for transmitter control is on Junction Box JB–70–A.
Antenna–tuning unit	These models are equipped with Antenna Tuning Unit BC–729–(*). (See figs. 1 and 2.)	This model is equipped with Antenna Tuning Unit BC–939–A. (See fig. 3.)

9. Operating Differences

Table II, which follows, indicates the operating differences between models of Radio Transmitters BC–610–(*).

Table II. Operating Differences Between Models

Part	Radio Transmitter BC–610–(*)	
Meters	ABCD M1, according to position of switch SW8, indicates grid current of intermediate-amplifier tubes V10, and VII, and p-a tube V16. Connections from M1 are made from the upper control panel to the r-f section directly through terminal strips TS2, TS1, and then through plugs PL1 and PL2. (See figs. 9, 42, 43, and 44.)	E M1, according to position of SW8, indicates plate current of buffer-doubler tube V9, plate and grid current of intermediate-amplifier tubes V10 and V11, and grid current of p-a tube V16. Connections from M1 are made from the upper control panel to the r-f section through the socket SO11 and PL11, and then through terminal strip TS2. (See figs. 9 and 45.)
	ABCD M2, according to position of switch SW9, indicates plate current of buffer-doubler tube V9, and intermediate-amplifier tubes V10 and V11. (See figs. 9, 42, 43, and 44.)	E M2 (switch SW9 is not present) indicates plate current of p-a tube V16. (See figs. 9 and 45.)
	ABCD M3 indicates filament voltage for p-a Tube V16. (See figs. 9, 42, 43, and 44.)	E M3 indicates same as ABCD. (See figs. 9 and 45.)
	ABCD M4 indicates the plate current of modulator tubes V3 and V4. (See figs. 11, 12, 42, 43, and 44.)	E (M101 on Speech Amplifier BC–614–( ) indicates the plate current of modulator tubes V3 and V4 on this model.) M4 indicates antenna current and resonates the plate current of p-a tube V16. (See fig. 45.)
	ABCD M5 indicates plate current of p-a tube V16. (See figs. 9, 42, 43, and 44.)	E M5 is omitted. (See fig. 45.)
	ABCD M6 indicates antenna current and resonates plate current of p-a tube V16. (See figs. 42, 43, and 44.)	E M6 is omitted. (See fig. 45.)
Meter shunt resistors	ABCD R26 and R27. (See figs. 42, 43, and 44.)	E R26, R27, R28, and R33. (See fig. 45.)
Plug-in tuning units	ABCD These models are equipped with three sets of tuning units, six per set. (See fig. 7.)	E This model is equipped with three sets of tuning units, eight per set. (See fig. 8.)
Plug-in coil units	ABCD These models are equipped with two sets of coil units, four per set. (See fig. 7.)	E This model is equipped with two sets of coil units seven per set. (See fig. 8.)
Crystal control	ABCD When operating with crystal control, tube V9 serves as a buffer amplifier between 2 to 4 mc, and as a frequency doubler between 4 to 8 mc.	E When operating with crystal control, tube V9 serves as a buffer amplifier between 2 to 4 mc, and as a frequency doubler between 4 to 12 mc. In the frequency range from 12 to 18 mc the crystal is operated at 1/4 the output frequency.
Frequency range	ABCD Frequency range is from 2 to 8 mc. For extension of frequency range to 18 mc by using Frequency Conversion Kits MC–509, MC–516, and MC–517. (C1, TM 11–280.)	E Frequency range is from 2 to 18 mc.

Table II. Operating Differences Between Models—Continued

Part	Radio Transmitter BC-610-(*)	
Terminal strip TS1	ABC In models A and B, terminals 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, and 12 on terminal strip TS1 correspond respectively, to terminals 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 on terminal strip TS1 in model C. (See figs. 10, 42, and 43.) D In model D, terminals 1, 4, 5, 6, 7, 8, 9, 10, and 11 of terminal strip TS1 are the same as in model C. Terminal 2 is not utilized because this circuit is completed through terminal 2 of socket PL3. Terminal 3 of terminal strip TS1, the oscillator cathode connection, goes directly to terminal 8 of plug PL 1.1 instead of through the phone-c-w switch SW7 and terminal 12 of terminal strip TS1. Terminal 12 is not utilized. (See figs. 10 and 44.)	E Terminal strip TS1 is similar to that of model D except that terminal 6 is not used because model E is equipped with fewer meters. (See fig. 45.)
	CD Terminal 1 on terminal strip TS1 grounds filament circuits of r-f section, phone tap on switch SW7, and terminal 7 on plug PL 1.1. (See figs. 10, 43, and 44.) AB A grounding lug is provided in the r-f section for these functions. (See figs. 10 and 42.) C Terminal 8 of terminal strip TS1 serves as a tie-in connection between resistors R26 and R27. (See figs. 10 and 43.) AB Resistors R26 and R27 are directly connected. (See figs. 10 and 42.)	
Terminal strip TS2	ABCD Terminals 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, and 12 on terminal strip TS2 on models A and B correspond respectively to terminals 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 on terminal strip TS2 of models C and D. CD Terminal 1 is not utilized. (See figs. 9, 42, 43, and 44.)	E Connections to TS2 from the r-f section are similar to model D except that terminal 2 is not utilized because model E is equipped with fewer meters. (See fig. 45.)
	ABCD Connection between resistors R26 and R27 is made through terminal 4 of terminal strip TS2 on models A and B, whereas the resistors are directly connected on models C and D. (See figs. 9, 42, 43, and 44.)	E Due to different meter arrangement, meter shunt resistors R28 and R33 are used in addition to resistors R26 and R27, and all four resistors are connected to socket SO11. (See fig. 45.)
	ABCD Connection to terminal strip TS2 from the upper control panel for terminals 5, 6, 7, 8, 9, 10, 11, and 12 are made directly. (See figs. 9, 42, 43, and 44.)	E Connections to terminal strip TS2 from the upper control panel for terminals 5, 6, 7, 8, 9, 10, 11, and 12 are made through plug PL11 and socket SO11. (See fig. 45.)
Plugs and sockets	ABCD Plug PL3.1 and its corresponding socket PL3 are six contact units on models A, B, and C, whereas model D is provided with eight contact units because of relocation of fuses. (See figs. 13, 42, 43, and 44.)	E Same as model D, except that reference symbol on the E model for all plugs is PL and for all sockets SO. (See fig. 45.)

Table II. Operating Differences Between Models—Continued

Part	Radio Transmitter BC–610–(*)	
	ABCD Terminal 5 of socket PL5 is not utilized. (See figs. 42, 43, and 44.)	E Terminal 5 of SO5 connects directly to center tap of transformer T3, and to ground and center tap of transformer T5 through resistor R5. (See fig. 45.)
	ABCD Center tap of transformer T3 goes to terminal 10 of socket PL1, from there to terminal 10 of plug PL1, 1, then to terminal 6 of terminal strip TS1, then to terminal 2 of terminal strip TS2 to meter M4. (See figs. 12, 42, 43, and 44.)	E No connection is made from center tap of transformer T3 to terminal 10 of SO1, consequently terminal 10 of plug PL1, terminal 6 of terminal strip TS1, and terminal 2 of terminal strip TS2 are not utilized. (See fig. 45.)
Resistors	ABCD Resistor R8 is in the grid circuit of p-a Tube JAN–250TH (V16) (VT–220). (See figs. 42, 43, and 44.)	E Resistor R8 is in the grid circuits of intermediate-amplifier Tubes JAN–807 (V10 and V11) (VT–100–A). (See fig. 45.)
	ABCD Resistor R35 is not present in cathode circuit of Tube JAN–6V6GT (V8) (VT–107–A). (See figs. 42, 43, and 44.)	E Choke CH9 in cathode circuit of Tube JAN–6V6GT (V8) (VT–107 or VT–107–A) is shunted by resistor R35. (See fig. 45.)
	ABCD Resistor R28 is inserted in the plate supply for Tube JAN–6L6 (V9) (VT–115). (See figs. 42, 43, and 44.)	E Resistor R28 is omitted. (See fig. 45.)
Grid lead shields	ABCD Grid leads for Tubes JAN–2A3 (V1 and V2) (VT–95) are not shielded. (See figs. 42, 43, and 44.)	E Shields are present. (See fig. 45.)
Relay RY3	ABCD The grids of Tubes JAN–100TH (V3 and V4) (VT–218) receive their bias directly from R12, and do not feed through the contacts of relay RY3. (See figs. 11, 42, 43, and 44.)	E The grids of Tubes JAN–100TH (V3 and V4) (VT–218) feed through one set of the contacts of relay RY3. In the open position of these contacts, the grids of these tubes receive their bias through resistor R34. (See fig. 45.)
	ABCD The plate circuits of Tubes JAN–100TH (V3 and V4) (VT–218) feed through one set of contacts of relay RY3. (See figs. 42, 43, and 44.)	E The contacts of relay RY3 are not utilized. (See fig. 45.)
Capacitor C22	ABCD Capacitor C22 is connected in the bias supply to the class C p-a Tube JAN–250TH (V16) (VT–220) (See figs. 42, 43, and 44.)	E Capacitor C22 is omitted. (See fig. 45.)
Choke CH4	ABCD Tube JAN–6L6, (V9) (VT–115) obtains its grid voltage by voltage drops across choke CH4, grid leak resistor R23, and cathode resistor R24. (See figs. 42, 43, and 44.)	E Choke CH4 is omitted. (See fig. 45.)
Switches[1]	ABC These models are equipped with interlock switches SW5, SW10, SW11, and SW13. (See figs. 42 and 43.) D This model is equipped with interlock switches SW5, SW10, SW13, and SW16. (See fig. 44.)	E This model is equipped with switches SW2, SW5, SW10, and SW13. (See fig. 45.)

[1]Slight wiring differences are present in the band switches on different models.

Table II. Operating Differences Between Models—Continued

Part	Radio Transmitter BC–610–(*)	
	Exciter plate power switch SW3 is a single-pole, single-throw switch. (See figs. 13, 42, 43, and 44.)	E Exciter plate power switch SW3 is a double-pole, single-throw switch. The additional pole is used to bring ground to the cathode of oscillator Tube JAN–6V6GT (V8) (VT–107–A), and terminal 2 on socket SO5. (See fig. 45.)
	ABCD Switch SW8 is a double-pole, double-throw switch for meter M1. (See fig. 42.)	E SW8 is a two-section four-position switch for meter M1. (See fig. 45.)
	CD Switch SW8 is the same as above, except that only one section is used because of the method of connecting meter shunt resistors R26 and R27. (See fig. 43.)	

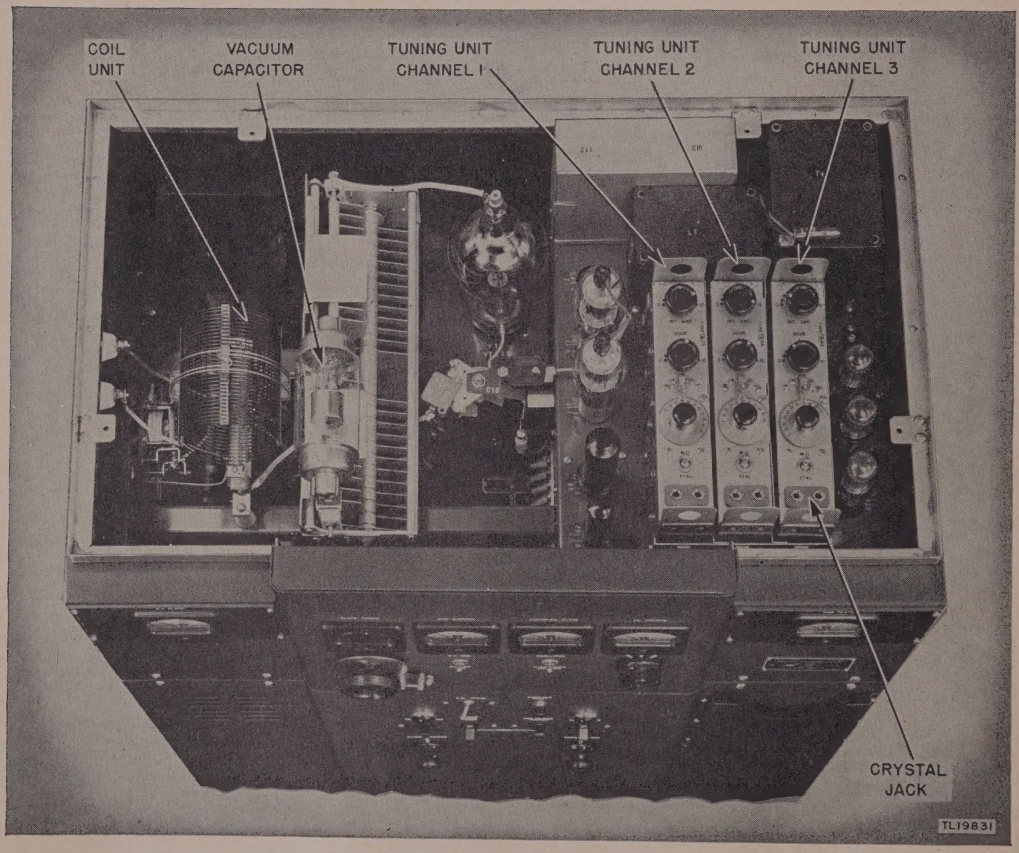


Figure 7. Radio Transmitter BC–610–A, –B, –C, and –D, top view, cover removed.

SECTION III

INITIAL REPAIR PROCEDURES

NOTE: Before any repairs of adjustments are made, all authorized modification work orders must be applied. See FM 21–6 for list of applicable MWO's.

10. General

Servicing personnel should follow the procedure outlined in this manual when repairing Radio Transmitter BC–610–(*). The repair information in this and the following sections is presented in the order in which the repairmen actually should perform the various operations on the equipment in the repair shop. This procedure permits repair of the equipment in the shortest time possible.

11. Special Tools, Test, Cleaning, and Lubrication Equipment

Table III lists the equipment required for performing the prescribed repair and inspection operations.

Table III. Tools, Test, Cleaning, and Lubrication Equipment

Item	Description
Tools:	
Screw drivers	Small, medium, and large; insulated for 5,000 volts.
Pliers	Long-nose, gas, and cutting; with insulated grip.
Knife	Electrician's knife.
Mirror, dental	Magnifying.
Socket wrenches	Small, medium, and large.
Files	Fine-cut and jeweler's.
Probe, insulated	
Test Equipment:	
Tube tester	(Such as tube tester in Test Set I–56–(*).
Voltohmmeter	0 to 10 megohms; a-c and d-c voltages 0 to 3,000 volts; direct current, 0.1 milliampere to 15 amperes (such as voltohmeter Test Set I–56–(*)).
R-f ammeter	Thermocouple type; range 0 to 2.5 amperes.
Cathode-ray oscilloscope	3-inch screen or larger.
Frequency Meter Set SCR–211–(*)	Heterodyne frequency type, or equivalent; range 125 kc to 20 mc.
Audio signal generator or oscillator	400 cycles per second such as Signal Generator I–72–(*).
Neon lamp	5 watt.
Dummy antenna	146-ohm resistor (400-watt); 50 mmf variable capacitor; 7,500 to 10,000 d-c working volts.
Test leads	
Voltmeter, a-c; or vacuum-tube voltmeter, a-c.	20,000-ohm-per-volt sensitivity.

Table III. Tools, Test, Cleaning, and Lubrication Equipment—Continued

Item	Description
Associated equipment for audio signal generator:	
Capacitor	8 mf.
Resistor	100 ohms, 2 watts, noninductive.
Plug	Phone; three-contact.
Associated equipment:	
Speech Amplifier BC–614–( )	An appropriate model for the transmitter under test, to permit matched components.
Junction Box JB–70–A (Use only with Radio Transmitter BC–610–E)	
Power Unit PEO95–( )	Acceptable substitute is a standard 12-volt, d-c battery; and 115-volt, 60-cycle, single-phase a-c generator capable of supplying 5 kw.
Radio Receivers BC–312–( ) and BC–342–( ) or equivalent Key J–37 or equivalent.	
Microphone T–50–( ) or equivalent.	Dynamic type.
Cords.	For Radio Transmitters BC–610–A through BC–610–D: F11; transmitter a-c power cord. F12; cord connecting transmitter and Speech Amplifier BC–614–( ). For Radio Transmitter BC–610–E; these cords are respectively CD763 and CD–764.
Cleaning Equipment:	
Solvent, dry-cleaning	
Assorted brushes	1/2-inch to 2-inch width.
Blower	Bellows or compressed air.
Heater	
Pipe cleaners	
Clean cloths	Lintless, 6 x 6 inches.
Sandpaper	#0000.
Crocus cloth	
Lubrication Equipment:	
Oil, Engine (OE)	For temperature above 0°F.
Oil, Lubricating, Preservative, Special (PS)	For temperature below 0°F.
Grease, Special, Lubricating (GL)	For all temperatures.

12. Removal of Plug-In Parts

a. TUBES. (1) *Tube JAN–250TH (V16) (VT–220) (fig. 9) and Tubes JAN–100TH (V3 and V4) (VT–218) (figs. 11 and 12).* To remove tubes, disconnect grid connection from side of tube, and plate spring clip from top of tube; turn the tube counterclockwise until unlocked, and lift out of socket.

(2) *Tubes JAN–807 (V10 and V11) (VT–100) (fig. 9).* To remove tubes, disconnect plate spring clip from top of tube and lift tube out of socket. On Radio Transmitter BC–610–E, disconnect base clamps before lifting tube out of socket.

(3) *Tubes JAN–866 (V6 and V7) (VT–46–A) (fig. 14).* To remove tubes, disconnect plate spring clip from top of tube; turn the tube counterclockwise until unlocked, then lift out of socket.

(4) *All other tubes (figs. 9 and 11).* To remove tubes, just pull them out of sockets.

b. Other Plug-in Parts. (1) *Vacuum capacitors (figs. 9, 15, and 16).* To remove, grasp firmly the glass shell, but do not press excessively; release from spring clips, one clip at a time.

(2) *Tuning units (figs. 7, 8, and 9).* To remove, place fingers in the holes of side plate and pull out. If there is any difficulty, rock the tuning unit gently. Do not hold tuning units at their dials.

(3) *Coil units (figs. 7, 8, and 9).* To remove, grasp the coil at ends of mounting strip, and pull up and out.

(4) *Crystals (figs. 7, 8, and 9).* To remove holder, grasp holder grip and lift out.

(5) *Fuses (figs. 2 and 5).* To remove, unscrew the retaining cap.

(6) *Heater element (figs. 5 and 6).* To remove the 600-watt heater element, R19, grasp at the top and unscrew. Do not touch coil winding.

(7) *Plugs (figs. 11, 12, and 13).* To remove, grasp plug and pull out. Do not grasp the cord.

13. Access to Transmitter Components

a. Access to Chassis. (1) Disconnect the pair of leads connected to TS5 on the r-f section.

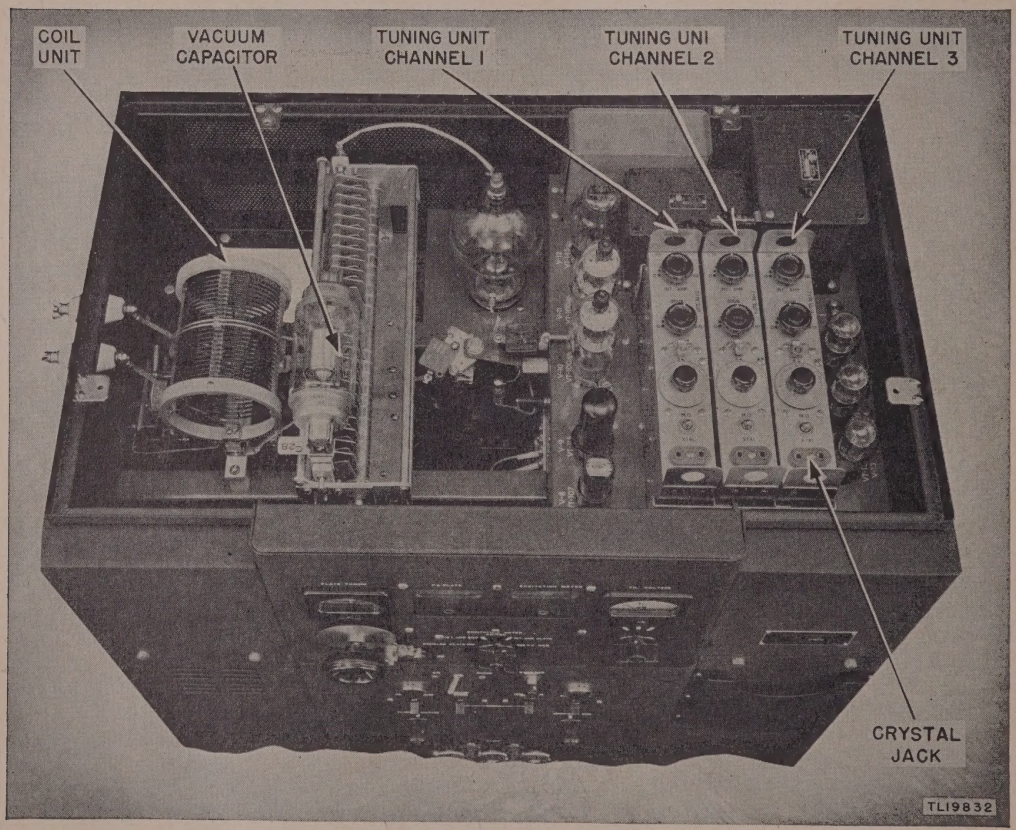


Figure 8. Radio Transmitter BC–610–E, top view, cover removed.

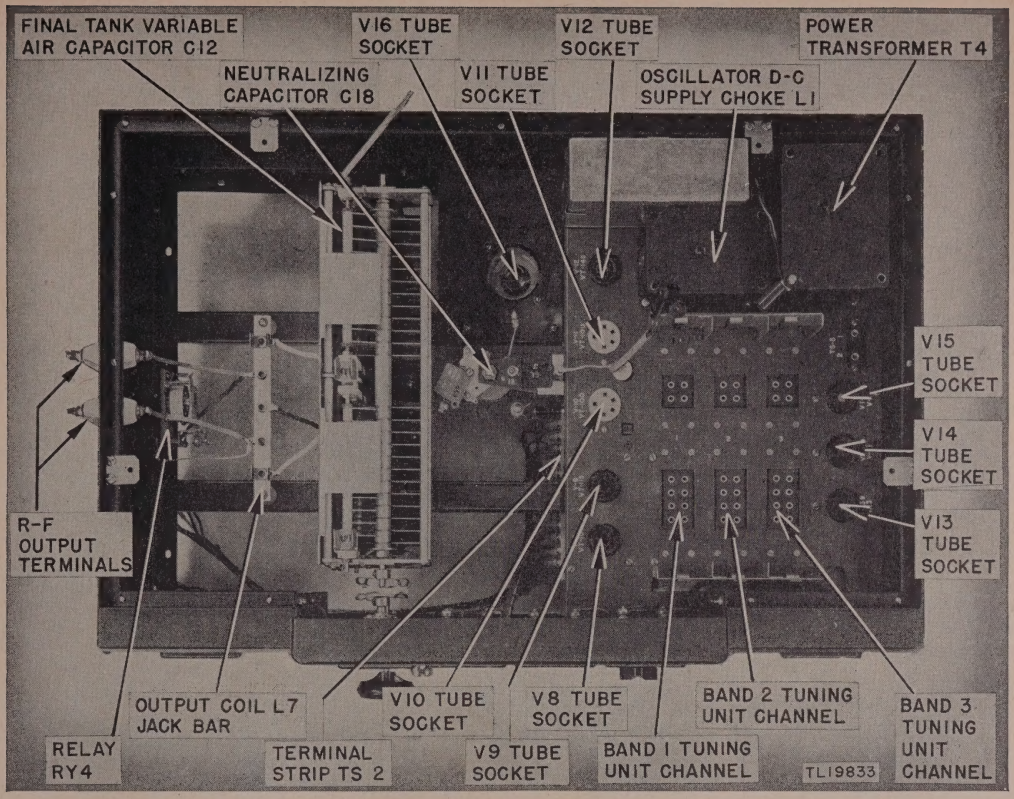


Figure 9. Radio Transmitter BC–610–A, –B, –C, and –D, r-f section, top view, less tubes, tuning units, coil unit, and vacuum capacitor.

(2) Unscrew four wing bolts holding the cover down and lift straight up to remove. (See figs. 7 and 8.)

(3) Remove seven wing bolts holding the back cover. (See figs. 5 and 6.)

(4) Lay the transmitter on its *right side* (side opposite feed-through insulators) to gain access to the bottoms of the r-f chassis, modulator chassis, and power supply chassis. (See figs. 10 and 12.)

b. Preparation for Repair Work on r-f Section (figs. 9 and 10). (1) Disconnect four wires which are tied into a small cable from the terminal strip TS1 on the r-f chassis apron.

(2) Disconnect both leads from the P. A. PLATE meter M5 (M2 on Radio Transmitter BC–610–E).

(3) Disconnect the twisted pair feeding the coil on the antenna change-over relay RY4.

(4) Disconnect the black heavy high-tension lead from the final tank capacitor mounting strip.

(5) Remove two plugs PL1.1 and PL2.1 from their sockets PL1 and PL2 (on Radio Transmitter BC–610–E, plugs PL1 and PL2 and sockets SO1 and SO2 respectively).

(6) Remove 14 screws and nuts which tie the upper lip of the modulator section to the lower lip of the r-f section.

(7) Lift the r-f section from the remaining units.

14. Chassis Cleaning, Inspecting, and Lubricating

a. Cleaning. Thorough cleaning of the transmitter is necessary to insure best performance; and to prevent corrosion, rust, and dirt from damaging parts, from causing arc-over and leakage or flash-overs of high voltage between terminals. Remove loose dust and dirt from the chassis with a brush or blower. Remove dirt or grease which

adheres to the chassis with a brush or cloth; or, in severe cases, use dry-cleaning solvent (SD). Clean specific parts in accordance with the following instructions:

(1) *Capacitors.* Clean dirty or corroded terminals and leads with a crocus cloth or cloth moistened with dry-cleaning solvent (SD). Then polish with a clean, dry cloth. In damp climates, beads of water form in capacitors. Under such conditions, dry the capacitor thoroughly with a small portable heater. Clean paper bodies of capacitors with a small, soft brush. For ceramic and metal bodies use a dry, clean cloth.

(2) *Crystals.* Holding the crystal carefully by the edges, wash separately with dry-cleaning solvent (SD) or with soap and water. When using soap and water, rinse in clear water. Always dry the crystal in warm air.

(3) *Resistors.* Ferrule type resistors may be cleaned by using a dry brush, or crocus cloth moistened with dry-cleaning solvent (SD). In severe cases use #0000 sandpaper. Finally wipe with a clean, dry cloth. Dust the pigtail type resistor with a brush or air blower.

(4) *Potentiometer and rheostat.* Clean dirt from contact arm and resistor winding with soft brush, and polish with a soft, clean cloth. Remove corrosion and grease with a brush dipped in dry-cleaning solvent (SD). Polish with a clean cloth. To clean burned or pitted contact point of the sliding arm, place a piece of folded crocus cloth between the contact and the winding, and then slide the arm several times over the crocus cloth.

CAUTION: Take care not to nick the wires, as altering the thickness of the wire will change the resistance value.

(5) *Fuses.* Clean all fuse mounts and clips with #0000 sandpaper. Remove deep pits with a

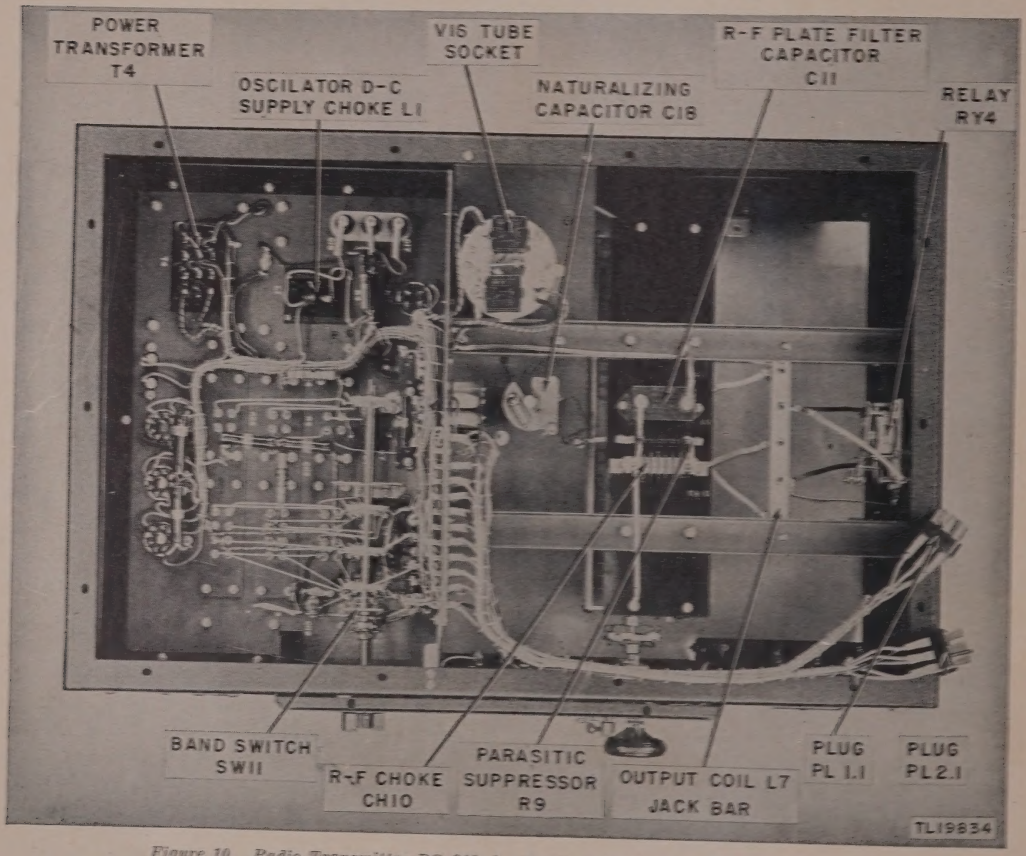


Figure 10. Radio Transmitter BC-610-A, -B, -C, and -D, r-f section, bottom view.

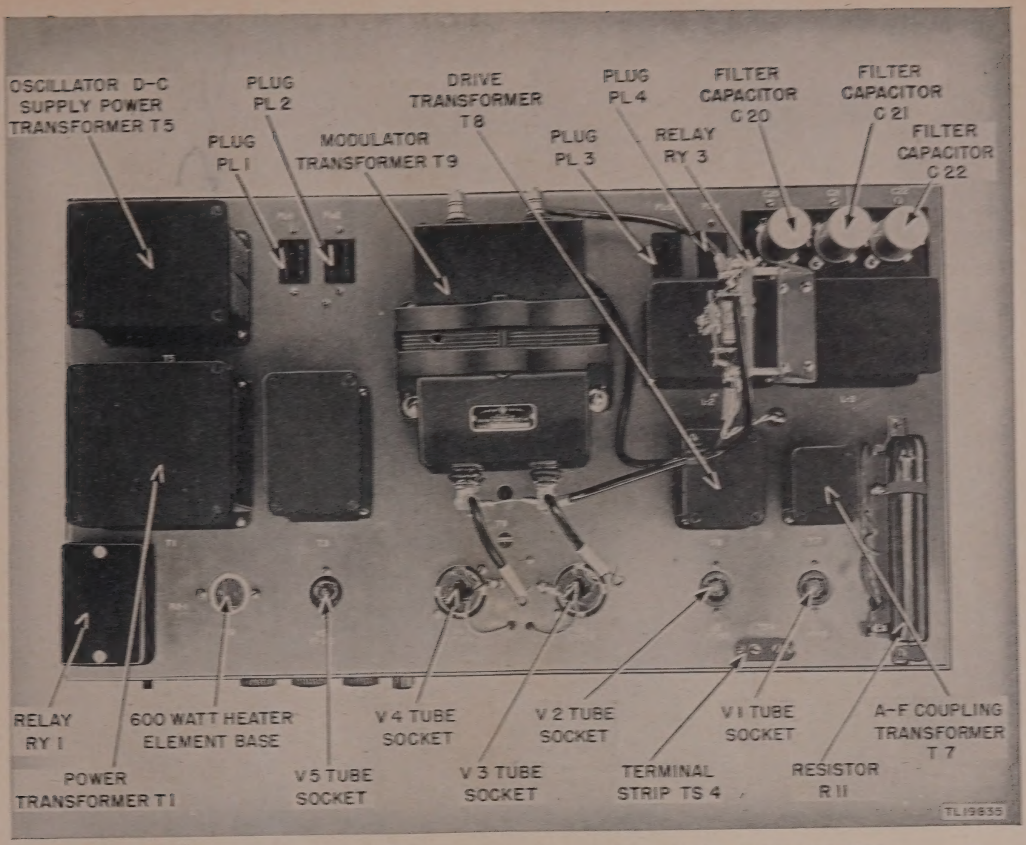


Figure 11. Radio Transmitter BC-610-A, -B, and -C, modulator section, top view.

file, followed with sandpaper. Finally wipe with a clean, dry cloth.

(6) *Relays.* Clean dirty cases with a cloth moistened with dry-cleaning solvent and then polish with a clean, dry cloth.

(a) Hard contacts. To clean hard contacts, draw a strip of clean wrapping paper between them while holding them together. If necessary moisten the paper with the dry-cleaning solvent. For corroded, burned, or pitted contacts, use a crocus cloth strip, or in extreme cases a jeweler's file followed by #0000 sandpaper. Polish with a clean, dry cloth.

(b) Silver contacts. Clean with brush dipped in dry-cleaning solvent. If corroded, dress first with crocus cloth. In extreme cases, resurface burned or pitted contacts with #0000 sandpaper, then smooth with crocus cloth. Polish with a clean, dry cloth.

CAUTION: Make certain that the original shape of the contacts has not been changed.

(7) *Switches.* For the purpose of repair, switches may be separated into two groups: those with accessible contacts, and those with contacts encased.

(a) Accessible contact switches. This group includes the wafer type and rotary selector switches. Clean dirty, dusty, corroded, or pitted terminals with a clean, dry cloth. In extreme cases, rub the surface of corroded points with a cloth moistened with dry-cleaning solvent. In very severe cases use #0000 sandpaper. Polish with a clean, dry cloth.

(b) Nonaccessible contact switches. This group includes interlock switches, toggle switches, and push buttons. If a defect is detected in the switch assembly, replace the assembly.

b. Inspection. After the transmitter has been

carefully and thoroughly cleaned, make a visual inspection of wiring for loose or poorly-soldered connections, frayed or burned insulation, and stretched leads. Inspect terminal boards for broken lugs and signs of previous arcing. Check all tuning dial gears and knobs for ease of operation. Make the necessary repairs and replacements. Inspect the following parts for typical defects.

(1) *Capacitors.* Check for loose terminals, cracked or broken insulators, loose bolts in mounting, case swelling, loose contact of terminal leads of pigtail type, loose shafts, bushings, bearings, and couplings. Tighten and adjust loose units, and replace defective capacitors.

(2) *Crystals.* Check for chipped, cracked, or broken holders. Replace the defective crystal unit.

(3) *Resistors.* Check for loose mounting, blistering or discoloration caused by overheating, chipped or cracked bodies, loose ferrule ends, and insufficient tension at end clips. Tighten end clips by hand or with a pair of pliers. Make replacements where necessary.

(4) *Rheostat and potentiometer.* Check for loose control knob on the shaft, insufficient spring tension of sliding arm, cracks and chipped places on insulating body. (See fig. 13.) Tighten carefully any part of rheostat or potentiometer assembly that is known to be loose. Adjust the sliding contact to provide sufficient tension. Use long-nose pliers.

(5) *Fuses.* Check for loose connections of clips, insufficient tension of fuse clips, loose and over-heated end caps. Tighen loose connections. Adjust the tension of fuse clips by pressing sides together, using a pair of pliers.

(6) *Relays.* Check for contacts unevenly lined up and incorrectly spaced, contacts which do not close properly when the plunger is hand operated,

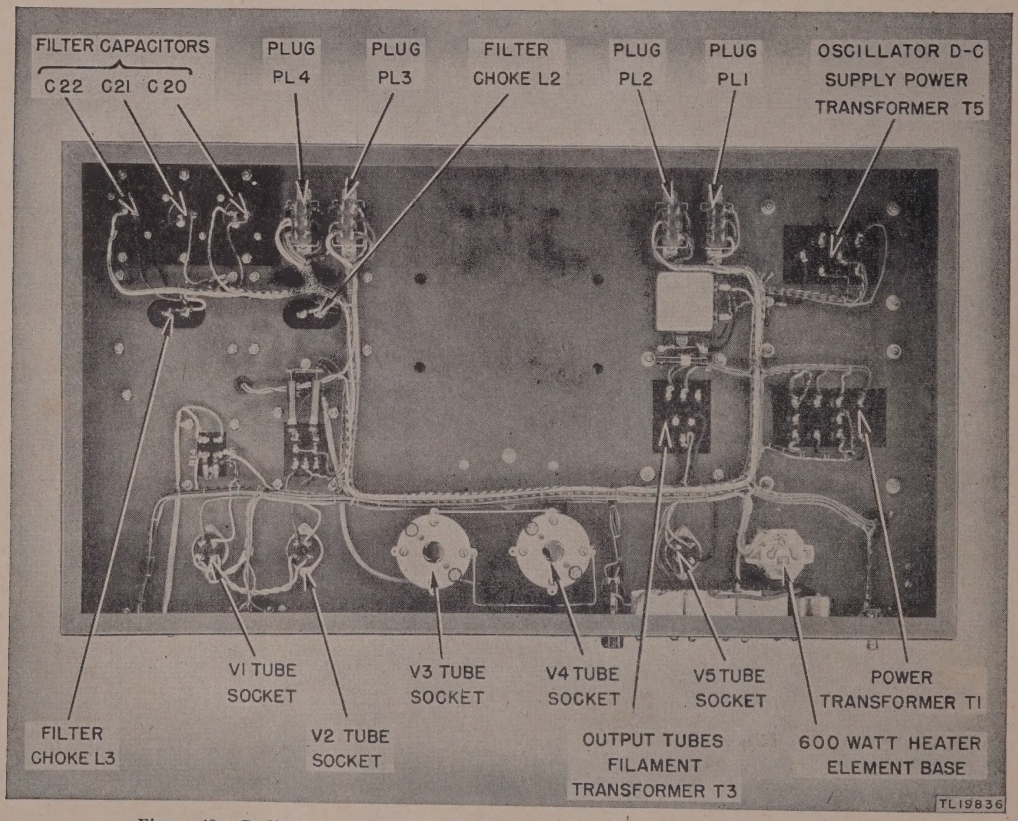


Figure 12. Radio Transmitter BC–610–A, –B, and –C, modulator section, bottom view.

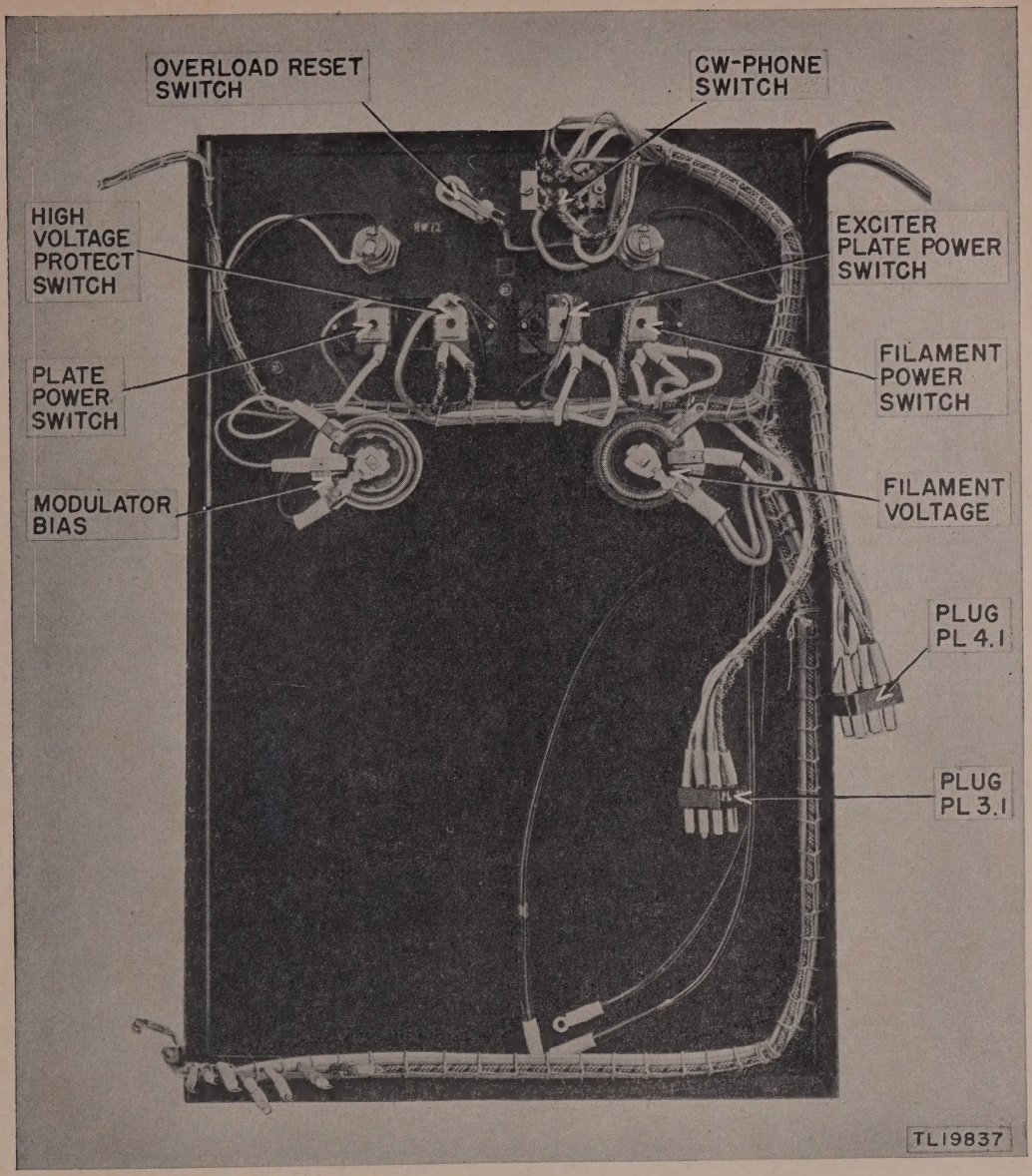


Figure 13. Radio Transmitter BC–610–A, –B, –C, and –D, power control panel, rear view.

insufficient tension of spring contacts, overheated coil and loose connections. Tighten all loose connections and mounting screws. Adjust relay contact spacings where necessary. See section IX for relay characteristics. Do not change the tension of spring contacts unless absolutely necessary. Contacts must retain their original shape during cleaning and repair. Make replacements where necessary.

CAUTION: Do not disassemble relays except in extreme cases. When disassembling, tag all leads as they are being removed.

(7) *Switches.* Check for loose terminal connections and mountings, loss of tension of fixed contacts, and broken wafers. Tighten all connections and mountings. Tighten the tension of fixed contacts, with long-nose pliers. Replace defective switches of the sealed type. Replace broken wafers of the gang type. If parts are not available, replace the entire switch assembly.

(8) *Transformers and choke coils.* Check for loose mounting lugs, loose terminals, and loose rivets. Look for signs of overheating by presence of insulating compound on the outside around the base of each transformer or coil. Tighten loose parts, and correct cause of overheating.

(9) *Meters.* Check for cracked or broken cases and meter glasses, no indication of meter zero when equipment is turned off, and loose connections. Tighten carefully to prevent breakage, by holding the hexagonal nuts, which are beneath the connecting lugs, while the outside nut is being tightened. To decide whether zero adjustment is needed, first tap the meter case lightly with the top of one finger. Make certain that the power is off. If adjustment is needed, insert the tip of a thin-blade screw driver in the slotted screwhead located below the meter glass, and slowly turn the adjusting screw until the pointer rests at zero. Replace broken cases and glasses. If the meter itself is damaged, replace it with one of identical type.

(10) *Pilot lamps.* Check for broken or cracked pilot light shields, loose bulbs, bulbs with loose bases, loose connections and mountings. Tighten mounting screws and resolder loose connections. Replace burned out lamps. Screw bulbs tightly into their bases; use friction tape to grip the glass envelope. Replace broken or cracked pilot light shields.

c. Lubrication. (See C1, TM 11–280.) Use engine oil (OE) for temperatures above zero degrees F; use special preservative lubricating oil (PS) for temperatures below zero degrees F; use

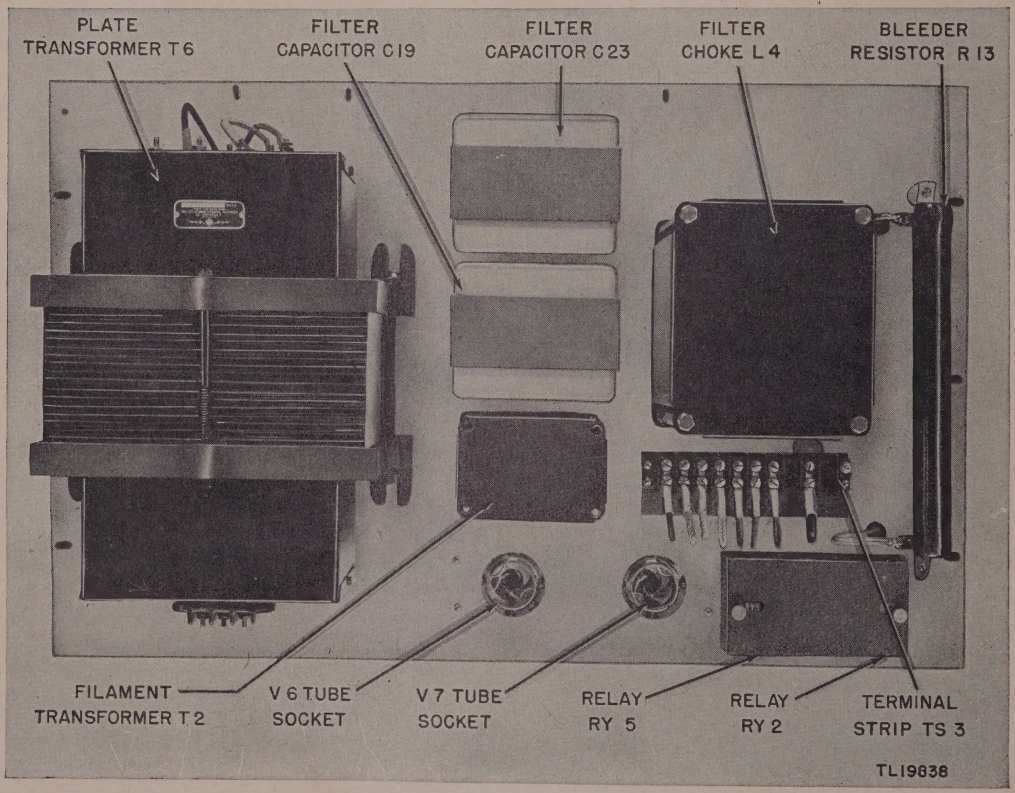


Figure 14. Radio Transmitter BC–610–A, BC–610–B, BC–610–C, and BC–610–D, power supply, top view.

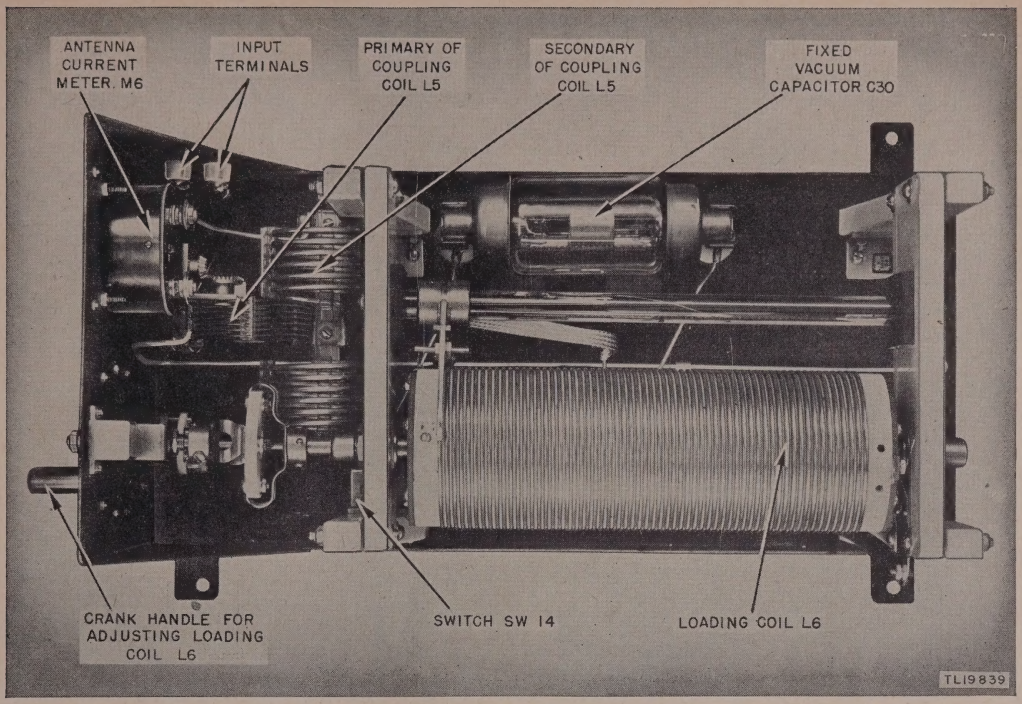


Figure 15. Antenna Tuning Unit BC–729–(*), top view, cover removed.

special lubricating grease (GL) where indicated, and in all temperatures. Lubricate *only* at the points specified, and wipe off superfluous lubricant.

(1) *Transmitter BC–610–(*).* Points requiring lubrication every 256 hours:

(a) Capacitor shaft bearings. Place one or two drops of special preservative lubricating oil (PS) on each of three bearings.

(b) Tuning control shaft bearings. Place one or two drops of special preservative lubricating oil (PS) on each of two bearings.

(c) Tuning control gears. Lubricate teeth sparingly with special preservative lubricating oil (PS).

(2) *Antenna tuning units BC–729–(*) and BC–939–A.* Points requiring lubrication every 256 hours:

(a) Load coil shaft bearings. Place one or two drops of special preservative lubricating oil (PS) on each of three bearings.

(b) Primary coil control shaft. Place one or two drops of special preservative lubricating oil (PS) on shaft.

(c) Primary coil shaft bearings. Place one or two drops of special preservative lubricating oil (PS) on bearings.

(d) Capacitor switch shaft rear bearings. Place one of two drops of special preservative lubricating oil (PS) on bearing.

(e) Capacitor switch front bearing. Lubricate with oil can.

(f) Primary coil dial control shaft. Lubricate with oil can any points requiring lubrication every 256 hours.

(g) Load coil control bevel pinions. Clean and coat teeth sparingly with special lubricating grease (GL).

(h) Ball spring plunger and disk. Clean and coat sparingly with special lubricating grease (GL).

(i) Primary coil control gear and pinion. Coat teeth sparingly with special lubricating grease (GL). For a full description of lubrication, see TB SIG 69.

15. Cleaning, Inspecting, and Testing Tubes

a. Cleaning. Clean glass envelopes of tubes with a cloth moistened with water. Dry and polish with clean cloth. Remove corrosion or rust from grid and plate caps with #0000 sandpaper or crocus cloth. Remove extraneous solder on pins of metal tubes with #0000 sandpaper. Do not damage pin stud. Touch up with soldering iron. Polish pins with #0000 sandpaper, and clean, dry cloth.

b. Inspecting. Inspect tubes for cracks in glass or base, for bent or broken prongs, loose tube caps, looseness of glass envelope from tube base, and looseness in the connection between spring clips and tube caps.

c. Testing. Test tubes according to the following instructions:

(1) *Receiver type tubes.* Use a tube tester.

(a) Test tubes in accordance with instructions given in the tester manual for the particular tube under test.

(b) Test tube for leakage or shorts between the elements of the tube. If the tube tests shorted, discard it.

(c) If leakage is not indicated, make emission test in accordance with chart. If the tube registers "weak," "questionable," or "bad," replace it.

(d) Compare performance of tube in its own socket with that of a new tube of known good quality, or test doubtful tubes in a transmitter known to be operating normally.

(2) *Transmitter type tubes.*

(a) Make continuity tests for large transmitter type tubes.

(b) Make comparative operating tests using a similar piece of equipment known to be operating normally.

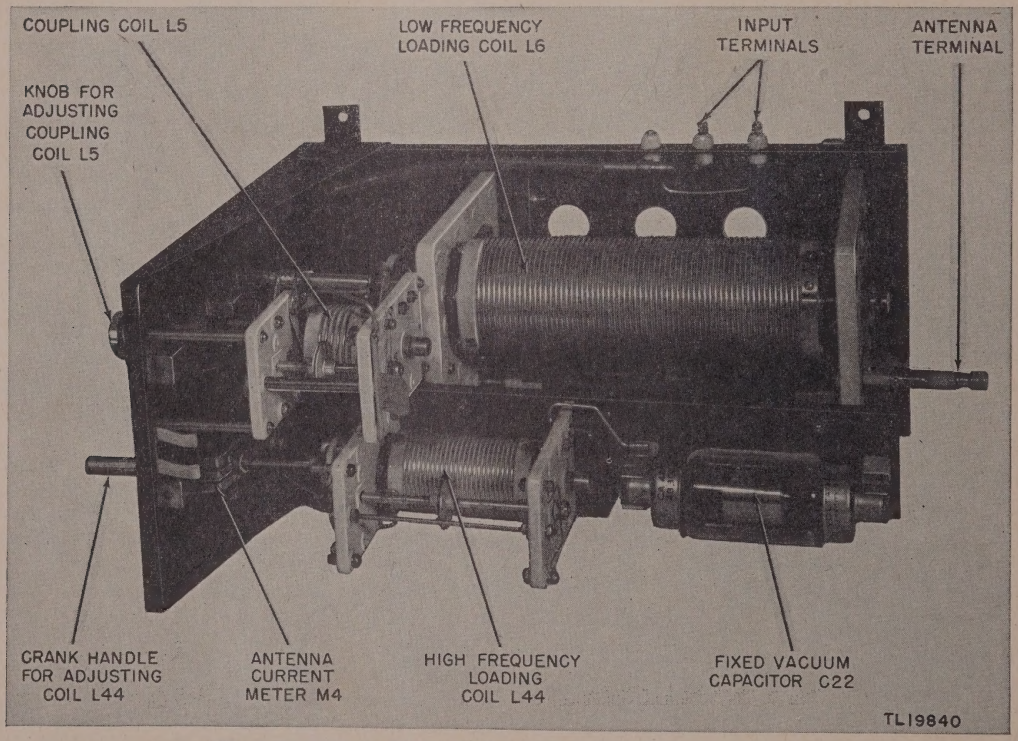


Figure 16. Antenna Tuning Unit BC–939–A, top view, cover removed.

SECTION IV

PRELIMINARY TROUBLE-SHOOTING PROCEDURES

16. Tests of Resistance of Power Supplies

a. General. Troubles within the equipment can be detected often by testing the resistance of the power supplies at the power input and output terminals before applying power to the equipment, thereby preventing damage to the power supplies.

(1) Perform the following tests with a-c power off, tubes removed except where indicated otherwise, and all plugs disconnected. Before beginning these tests make a careful inspection of the wiring on the lower and upper control panels to make certain that there are no short circuits or open circuits, since the results of the tests outlined below give no indication of defects within wiring circuits.

(2) If the measurements in the following tests indicate a defective component circuit, test each component part in the circuit with ohmmeter for possible grounds, leakage, and short circuits or open circuits. Make the necessary repairs and replacment of defective parts.

(3) The values contained in these tests are approximate. Any test value indicated which is not within tolerance should be investigated.

b. Tests for Radio Transmitters BC–610–A through BC–610–C. (1) *High-voltage power supply.* Before performing these tests remove connections from terminal strip TS3 on high-voltage power side, taking precaution to prevent wires from touching one another.

(a) Input resistance. Adjust ohmmeter to range which permits the lowest resistance scale measurement. Place ohmmeter test leads between wires 1 and 3 of terminal strip TS3. Reading on ohmmeter will indicate:

Normal – 1 ohm ± 10 percent.

Defective – zero or infinite.

Adjust ohmmeter to range which permits the lowest resistance measurement.

Place ohmmeter test leads between wires 4 and 7 of terminal strip TS3.

Reading on ohmmeter will indicate:

Normal – 11 ohms ± 10 percent.

Defective – zero or infinite.

(b) Output resistance. Adjust ohmmeter to permit a resistance measurement within 0- to 100,-000-ohm scale. Place ohmmeter test leads between wires 8 and 9 of terminal strip TS3. Reading on ohmmeter will indicate:

Normal – 75,000 ohms ± 10 percent.

Defective – zero or infinite.

(2) *Power supply of modulator section. (a) Input resistance.* Adjust ohmmeter to scale which permits the lowest resistance measurement.

1. Place ohmmeter test leads between terminals 9 and 10 of socket PL3. Reading of ohmmeter will indicate:

Normal – 1.5 ohms ± 10 percent.

Defective – zero or infinite.

2. Place ohmmeter test leads between terminal 9 of socket PL3 and terminal 12 of socket PL4. Reading of ohmmeter will indicate:

Normal – 1.5 ohms ± 10 percent.

Defective – zero or infinite.

3. Place ohmmeter test leads between terminals 8 and 9 of socket PL3. Reading on ohmmeter will indicate:

Normal –3 ohms ± 10 percent.

Defective – zero or infinite.

(b) Output resistance. Adjust ohmmeter to permit a resistance measurement within 0- to 100,-000-ohm scale. Before performing the output resistance test, check resistor R11 whose value should be 2,500 ohms. Replace this resistor if its value is not within tolerance. Place ohmmeter test leads between terminal 7 of socket PL1 and terminal 9 of socket PL4. Reading on ohmmeter will indicate:

Normal – 50,000 ohms ± 10 percent.

Defective – zero or infinite.

(3) *Power supply of R-f section. (a) Input resistance.* Perform this test with voltage regulator Tubes JAN–003/VR150, (V13, V14, V15) (VT–139) placed in their sockets. Adjust ohmmeter to the scale which permits the lowest resistance measurement. Place ohmmeter test leads between terminals 6 and 7 (BC–610–A and BC–610–B) or terminals 7 and 8, (BC–610–C) of terminal strip TS1. The reading on ohmmeter will indicate:

Normal – 1.5 ohms ± 10 percent.

Defective – zero or infinite.

(b) Output resistance. Perform this test with switch SW9 in open positions. Adjust ohmmeter to permit a resistance measurement with 0- to 10,-000-ohmmeter scale. Place ohmmeter test leads

between chassis ground and terminal 8 of terminal strip TS2. The reading on ohmmeter will indicate:

Normal – 40,000 ± 10 percent.

Defective – zero or infinite.

c. Tests for Radio Transmitters BC–610–D and BC–610–E.

(1) *High-voltage power supply. (a) Input resistance.* See the test for Radio Transmitters BC–610–A through BC–610–C. (See *a* (1) *(a)* above.)

(b) Output resistance. See the test for Radio Transmitters BC–610–A through BC–610–C. (See *a* (1) *(b)* above.)

(2) *Power supply of modulator section. (a) Input resistance.* Adjust ohmmeter to scale which permits the lowest resistance measurement.

1. Place ohmmeter test leads between terminals 1 and 6 of socket PL3 (SO3 on transmitter BC–610–E). Reading on ohmmeter will indicate:

Normal – 1.5 ohms ± 10 percent.

Defective – zero or infinite.

2. Place ohmmeter test leads between terminal 5 of socket PL3 (SO3 on BC–610–E) and terminal 12 of socket PL4 (on BC–610–E). Reading on ohmmeter will indicate:

Normal – 1.5 ohms ± 10 percent.

Defective – zero or infinite.

3. Place ohmmeter test leads between terminals 4 and 5 of socket PL3 (SO3 on BC–610–E). Reading on ohmmeter will indicate:

Normal – 3 ohms ± 10 percent.

Defective – zero or infinite.

(b) Output resistance. See test for Radio Transmitters BC–610–A through BC–610–C (see *a* (2) *(b)* above. Radio Transmitter BC–610–E differs in the omission of capacitor C22, and sockets PL1 and PL4 marked respectively SO1, and SO4. (See sec. II, table II.)

(3) *Power supply of R-f section. (a) Input resistance.* Perform this test with voltage regulator tubes V13, V14, V15, in their sockets. Adjust ohmmeter to scale which permits the lowest resistance measurement. Place ohmmeter test leads between terminals 7 and 8 of terminal strip TS1. Reading on ohmmeter will indicate:

Normal – 1.5 ohms ± 10 percent.

Defective – zero or infinite.

(b) Output resistance. Adjust ohmmeter to permit a resistance measurement within 0- to 100,000-ohm scale. Place ohmmeter test leads between chassis ground and terminal 8 of terminal strip TS2. Reading on ohmmeter will indicate:

Normal 0 – 40,000 ohms ± 10 percent.

Defective – zero or infinite.

17. Tests of Input Resistance at Power Input Plug

Perform the following tests with a-c power off, tubes removed, and all plugs disconnected.

a. Tests for Transmitters BC–610–A through BC–610–C. (1) *Short-circuit test.* Place ohmmeter test leads across a-c socket PL6. Reading on ohmmeter will indicate:

Normal – infinite.

Defective – zero.

If the above measurement indicates a defective circuit, test each component in the circuit with ohmmeter for *short* circuits. Make the necessary repairs and replace defective parts.

(2) *Open-circuit test.* Place a temporary jumper across the terminals of PL6, then place ohmmeter test leads across terminals 7 and 9 of socket PL3. Reading on ohmmeter will indicate:

Normal – zero.

Defective – infinite.

If the above measurement indicates a defective circuit, test each component in the circuit with ohmmeter for an *open* circuit. Make the necessary repairs and replace the defective parts. After test, remove temporary jumper.

b. Tests for Transmitters BC–610–D and BC–610–E. (1) *Short-circuit test.* Place ohmmeter test leads across a-c socket PL6 (SO6 on BC–610–E). Reading on ohmmeter will indicate:

Normal – infinite.

Defective – zero.

If the above measurement indicates a defective circuit, test each component in the circuit with ohmmeter for short circuits. Make the necessary repairs and replace defective parts.

(2) *Open-circuit test.* Place a temporary jumper across the terminals of socket PL 6 (SO6 on BC–610–E), and place ohmmeter test leads across terminals 3 and 7 of socket PL3 (SO3 on BC–610–E). Reading on ohmmeter will indicate:

Normal—zero.

Defective—infinite.

If the above measurement indicates a defective circuit, test each component in the circuit with ohmmeter for open circuits. Make the necessary repairs and replace defective parts. After test, remove temporary jumper.

18. Tests of Continuity for Cables and Terminal Strips

a. Defects in Radio Transmitter BC–610–(*) can be detected by performing resistance tests of continuity through cables and terminals in accordance with the procedure outlined below in table IV.

b. Perform tests on ohmmeter range that permits a reading close to the center of scale. If the readings obtained do not agree with those specified in table IV, within plus or minus 10 percent, the circuit is defective. If an infinite reading is obtained in a test for which zero is specified in table IV, there is an open circuit in the circuit under test. Check the circuit for poorly soldered or broken connections, burned-out fuses, poor contacts between plug and sockets, loose connection at terminal strips. Also, by these tests short circuits and defective parts may be located. Make the necessary repairs and replacements.

c. Perform these tests with a-c power off, tubes removed, except where indicated otherwise, and all plugs connected in their proper sockets. On Radio Transmitters BC–610–A through BC–610–D the reference numbers for plugs are PL1.1 through PL4.1; the reference numbers for sockets are PL1 through PL6. The reference num-

Table IV. Continuity Tests for Cables and Terminal Strips

Part	Ref No.	Term or lead No.	Switch adjustments when measuring	Where measured to	Resistance (ohms)
Power supply terminal strip TS3	TS3	1		Terminal "O" of transformer T6.	0
		2		Terminal "2600" of transformer T6.	0
		3		Terminal "2000" of transformer T6.	0
		4		Terminal "ST" of transformer T2.	0
		5		Terminal "100" of transformer T2.	0
		5		Terminal 7 of terminal strip TS3.	0
		6		The open contact on relay RY2.	700
		8		Terminal "CT" of transformer T2.	50
		9		Ground or chassis.	0
Leads connecting to power supply terminal strip TS3.		1		Terminal 8 of plug PL4.1.	0
		1	SW4 at NORMAL.	Terminal 7 of plug PL4.1.	0
		2ABC[1]	SW7 at CW.	Terminal 11 of plug PL3.1.	0
		2DE	SW7 at CW. Fuses FS2 and FS3 must be in operating condition.	Terminal 7 of plug PL3.1.	0
		3ABC	SW7 at PHONE.	Terminal 11 of plug PL3.1.	0
		3DE	SW7 at PHONE. Fuses FS2 and FS3 must be in operating condition.	Terminal 7 of plug PL3.1.	0
		4	SW12 closed (not pressed).	Terminal 6 of terminal strip TS3.	0
		5ABC	SW7 at PHONE.	Terminal 12 of plug PL1.1.	0
		5DE	SW7 at PHONE.	Terminal 2 of plug PL3.1.	0
		7ABC		Terminal 12 of plug PL3.1.	0
		7DE		Terminal 8 of plug PL3.1.	0
		8		Terminal "+" of Meter M5.	0
		9		Terminal 9 of plug PL4.1.	500
Modulator socket PL1.	PL1	7		Any convenient ground point.	0
		8		Terminal 2 on socket PL5.	0
		9		To terminal 11 on socket PL1.	80
		10 ABCD		Terminal "CT" of transformer T3.	0
		12 ABC		Terminal 10 on socket PL3.	250
Modulator socket PL2.	PL2	7 ABC		Terminal 8 on socket PL3.	0
		7 DE		Terminal 4 on socket PL3.	0
		8 ABC		Terminal 9 on socket PL3.	0
		8 DE		Terminal 5 on socket PL3.	0
		10		Terminal 4 on socket PL5.	0

[1]Indicates radio transmitter model.

Table IV. Continuity Tests for Cables and Terminal Strips—Continued

Part	Ref No.	Term or lead No.	Switch adjustments when measuring	Where measured to	Resistance (ohms)
		11		Tap on resistor R11.	0
		12 ABC	Switch SW5 closed.	Terminal 12 on socket PL3.	200
		12 DE	Switch SW5 closed.	Terminal 8 on socket PL3.	200
Modulator socket PL3.	PL3	1DE		Terminal 1 on socket PL5.	0
		2DE		Terminal 6 on socket PL3.	250
		3DE		One side of the a-c line at socket PL6.	0
		7 ABC	Fuse FS1 must be in operating order.	One side of the a-c line at socket PL6.	0
		7 DE		One side of the a-c line at socket PL6.	0
		11 ABC	Fuses FS2 and FS3 must be in operating order.		0
Modulator socket PL4	PL4	7		Terminal 8 of socket PL4.	16
		9		Terminal "CT" of 500-0-500 winding of transformer T1.	2750
		10		Terminal "F" of transformer T8.	0 (on BC-610-E open circuit)
		11		Terminal 4 of socket PL5.	0
		12ABC		Terminal 9 of socket PL3.	1.5
		12DE		Terminal 5 of socket PL3.	1.5
Modulator plug connector PL1.1	PL1.1	7		Any convenient ground point.	0
		8AB	Switch SW7 at CW.	Terminal 2 of terminal strip TS1.	0
		8C	Switch SW7 at CW.	Terminal 3 of terminal strip TS1.	0
		8DE		Terminal 3 of terminal strip TS1.	0
		9AB		Terminal 3 of terminal strip TS1.	0
		9CDE		Terminal 4 of terminal strip TS1.	0
		10AB		Terminal 5 of terminal strip TS1.	0
		10CD		Terminal 6 of terminal strip TS1.	0
		11AB		Terminal 4 of terminal strip TS1.	0
		11CDE		Terminal 5 of terminal strip TS1.	0
Modulator plug connector PL2.1	PL2.1	7AB		Terminal 6 of terminal strip TS1.	0
		7CDE		Terminal 7 of terminal strip TS1.	0
		8AB		Terminal 7 of terminal strip TS1.	0
		8CDE		Terminal 8 of terminal strip TS1.	0
		10		Terminal 10 of terminal strip TS1.	0
		11		Terminal 9 of terminal strip TS1.	0
		12		Terminal 11 of terminal strip TS1.	0
Modulator plug connector PL3.1.	PL3.1	1DE	Fuse FS5 must be in operating order.	Terminal 5 of plug PL3.1.	0
		3DE	Fuse FS1 must be in operating order. Switch SW1 at ON.	Terminal 6 of plug PL3.1.	0
		4DE	Switch SW12 closed.	Terminal 6 of terminal strip TS3.	0
		5DE	Fuses FS2 and FS4 must be in operating order.	Terminal 7 of plug PL3.1.	0
		7ABC	Switch SW1 at ON.	Terminal 10 of plug PL3.1.	0
		8ABC		Terminal 4 of terminal strip TS3.	0
		9ABC		Terminal 5 of terminal strip TS3.	0

Table IV. Continuity Tests for Cables and Terminal Strips—Continued

Part	Ref No.	Term or lead No.	Switch adjustments when measuring	Where measured to	Resistance (ohms)
Modulator plug connector PL4.1.	PL4.1	10		Variable arm of MODULATOR BIAS control R12.	0
		11	Switch SW6 at ON.	Variable arm of FILAMENT VOLTAGE control R18.	0
		12	Switch SW3 at ON.	Variable arm of FILAMENT VOLTAGE control R18.	0
Modulator socket connector PL5.	PL5	1ABC	Fuses FS2, FS4, and FS5 in operating condition.	One side of the a-c line at socket PL6.	0
		1DE		Terminal 1 of socket PL3.	0
		3ABC		Terminal 10 at socket PL3.	0
		3DE		Terminal 6 at socket PL3.	0
		6		Terminal 7 of socket PL5.	35
		8		Any convenient ground point.	0
		AB CDE			
Exciter terminal board TS1.	TS1	1		Any convenient ground point.	0
		3		Terminal 8 at tube socket of tube V8.	60
	2	3 4		Terminal 2 or 3 at tube socket of tube V12.	0
		4 5		Terminal 3 or 2 at tube socket of tube V12.	0
		5		Terminal 1 at terminal strip TS2.	0
		6	(Not on BC–610–E.)	Terminal 2 at terminal strip TS2.	0
		6 7	Tubes V13, V14, and V15 must be in their sockets.		
		7 8		Terminal "ST" of transformer T4.	0
		8		Terminal 4 at terminal strip TS2.	0
		9 9		Terminal 6 at terminal strip TS2.	0
		10ABC	Switches SW10, SW11, and SW13 closed.	Terminal 11 at terminal strip TS1.	0
		10DE	Switches SW10, SW13, and SW16 closed (on BC–610–E switch SW2 corresponds with SW16).	Terminal 11 at terminal strip TS1.	0
		AB CDE			
Exciter terminal strip TS2.	TS2	2 3		Terminal "F" of tube socket of tube V16.	0
		3 4		Terminal "F" of tube socket V16.	0
		4 —	Switch SW8 at INT. AMP. GRID.	Terminal "+" of meter M1.	0
		5 5		Grid connection of tube V16.	1,000 (20 on BC–610–E)
		7 7		Terminal 3 of tube socket of tube V10 or V11.	70 (4,770 on BC–610–E)
		8 8		Terminal "CT" of 5-volt 3-amp winding on transformer T4.	125
		9 9		Terminal 4 of tube socket of tube V9.	50,000
		10 10		Terminal 2 of tube socket of tube V10 or V11.	20,000
		11 11		Ungrounded filament terminal of tubes V8, V9, V10, and V11.	0
		12 12		Any convenient ground point.	0
Leads connecting to exciter terminal strip TS2.	TS2	1 2 (not on BC–610–E)		Terminal "+" of meter M4.	0

Table IV. Continuity Tests for Cables and Terminal Strips—Continued

Part	Ref No.	Term or lead No.	Switch adjustments when measuring	Where measured to	Resistance (ohms)
		AB CDE			
		2 3		A terminal of meter M3.	0
		3 4		Other terminal of meter M3.	0
		5 5	Switch SW8 at P.A. GRID.	Terminal "—" of meterM1.	0
		6 6		Terminal "+" of meter M1.	0
		7 7	Switch SW8 at INT. AMP. GRID.	Terminal "—" of meter M1.	0
		8 8	(On BC–610–E Switch SW8 at DOUBLER-PLATE.)	Terminal "+" of meter M2. (M1 on BC–610–E.)	0
		9 9	Switch SW9 at BUFFER-DOUBLER 1. (On BC–610–E switch SW8 at DOUBLER-PLATE.)	Terminal "—" of meter M2. (M1 on BC–610–E.)	0
		10 10	Switch SW9 at INTER-MEDIATE AMPLI-FIER.	Terminal "—" of meter M2. (M1 on BC–610–E.)	0
		11 11		"Hot" lead on lamp socket (LM1).	0
		12 12		Any convenient ground point.	0
Exciter chassis tuning unit sockets PL7, PL8, and PL9.	PL7, PL8, and PL9	1	Switches SW11.1, SW11.2, SW11.3, SW11.4, and SW11.5 (on BC–610–E Switch SW11) are in No. 1, No. 2, and No. 3 positions respectively for the following checks on PL7, PL8, and PL9.	Terminal 5 at tube socket of tube V8.	0
		2		Any convenient ground point.	0
		3ABCD		Terminal 4 at tube socket of tube V9.	80,000
		4		Terminal on capacitor C1 opposite to connection from this capacitor to the cathode of tube V8.	0
		5ABCD		Terminal 4 at tube socket of tube V9.	50,000
		6ABCD		Terminal 4 at tube socket of tube V9.	70,000
		7ABCD		Terminal 6 at socket PL7, PL8, and PL9.	20
		7E		Terminal 9 of TS2.	20
		8		Terminal 3 at tube socket of tube V9.	0
		10		Any convenient ground point.	0
		11		Terminal 10 at terminal strip TS2.	20
		12		Plate caps of tubes V10 and V11.	0

bers for tuning unit sockets are PL7, PL8, and PL9. On Radio Transmitter BC–610–E the reference numbers for plugs are PL1 through PL4; the reference numbers for sockets are SO1 through SO6. The reference numbers for tuning unit sockets are SO7, SO8, and SO9.

CAUTION: Make certain that the switches are in the specified position required for the test.

19. Preparation of Set for Operation

a. Putting Back Plug-in Parts. (1) Tubes. Insert all tubes into their proper sockets, making certain that they are locked and tight, and that grid connections and plate spring clips are firmly connected.

(2) *Tuning units.* Select a tuning unit of the desired frequency range (table V or VI, depending on the model of the transmitter under test). Lift open the right-hand door in the cover of the transmitter and firmly insert the tuning unit in one of the three available channels marked 1, 2, or 3. Make certain that the switch on the tuning unit marked M.O.–XTAL faces the front of the transmitter. (See fig. 7 or 8.)

Table V. Tuning Components for Radio Transmitters BC–610–A Through BC–610–D

Tuning box for BC–610–A and BC–610–B.	Tuning unit for BC–610–C and BC–610–D.	Frequency range (mc)
A	TU–47	2.0 to 2.5
B	TU–48	2.5 to 3.2
C	TU–49	3.2 to 4.0
D	TU–50	4.0 to 5.0
E	TU–51	5.0 to 6.35
F	TU–52	6.35 to 8.0
Tank coil for BC–610–A and BC–610–B.	**Coil unit for BC–610–C and BC–610–D.**	**Frequency range (mc)**
51A438 with Capacitor CA–423	C–387	2.0 to 2.55
51A438	C–387	2.55 to 3.4
51A439	C–388	3.4 to 4.4
51A440	C–389	4.4 to 5.7
51A441	C–390	5.7 to 8.0

Table VI. Tuning Components for Radio Transmitter BC–610–E

Tuning unit	Frequency range (mc)
TU–47	2.0 to 2.5
TU–48	2.5 to 3.2
TU–49	3.2 to 4.0
TU–50	4.0 to 5.0
TU–51	5.0 to 6.35
TU–52	6.35 to 8.0
TU–53	8.0 to 12.0
TU–54	12.0 to 18.0
Coil unit	**Frequency range (mc)**
C–387–B with Capacitor CA–423	2.0 to 2.5
C–387–B	2.5 to 3.5
C–388–A	3.5 to 4.5
C–389–A	4.5 to 5.7
C–390–A	5.7 to 8.0
C–447	8.0 to 11.0
C–448	11.0 to 14.0
C–449	14.0 to 18.0

(3) *Coil units.* Select a coil unit of the desired frequency range (table V or VI, depending on the model of the transmitter under test). Lift open the left-hand door in the cover of the transmitter and insert coil unit. (See fig. 7 or 8.)

(4) *Capacitor CA–423.* Insert this capacitor if operation in the 2.0- to 2.5-mc. frequency range is desired. Close the left-hand door firmly to insure operation of the interlock switches. (See fig 7 or 8).

(5) *Other plug-in parts.* Make certain that other plug-in parts, such as fuses, plugs, pilot lamps, and the 600-watt heater element, fit firmly into their sockets.

b. Connection of Power Unit. Select a power source which can supply 5 kilowatts at 115 volts (117 volts for Radio Transmitter BC–610–E) 50- or 60-cycle, single-phase, alternating current. Connect the power source to the transmitter, using Cord CD–763 or equivalent. When using Power Unit PE–95–( ), see TM 11–904, for details of operation.

c. Dummy Antenna. A dummy antenna consisting of a 164-ohm, 400-watt noninductive resistor (this value of resistance and wattage can be obtained using a series-parallel arrangement of ohmite resistors in series with a 50-mmf variable, air capacitor, 7,500 to 10,000 d-c volts (working) must be connected between the antenna post and the chassis of the antenna tuning unit. Connect the capacitor end of the series circuit to the antenna post, and the resistor end to the chassis.

d. Precautions Before Operation. Before attempting to operate Radio Transmitter BC–610–(*) always observe the following precautions:

(1) Read carefully paragraphs 19 and 20 of this section in order to become thoroughly familiar with this material.

(2) Never throw the CW-PHONE switch when the plate power is on.

(3) If Radio Receivers BC–312–( ) and BC–342–( ) are used, check their operation and condition as outlined in instruction book TM 11–850.

CAUTION: *Radio Transmitter* BC–610–(*) is equipped with extremely high voltages which are dangerous to life if contacted. The protective electrical interlock switches should not be relied upon. If the contact points of relay RY 1 stick, high voltages are still present in the transmitter after the interlock switches are operated. For this reason, be sure that the back cover and cover doors are closed before applying plate power. A red bull's-eye pilot lamp, labeled PLATE POWER, on the front panel of the transmitter indicates when the high-voltage supply is turned on. However, since this lamp may burn out, do not rely upon it to show that no high voltage is present. When the transmitter is in operation, extremely high r-f voltages are present around the antenna-tuning unit. Beware of r-f burns. Make certain that the voltage is off before changing parts and making repairs.

20. Operating Test

(See table VII, for correct operating values.)

a. Preliminary Adjustments for C–W Transmission. Always adjust the transmitter for c-w operation *first.* This is done as follows:

(1) See that the PLATE POWER switch of

the transmitter is at OFF, and left there, if Radio Receiver BC–312–( ) and BC–342–( ) are used, otherwise automatic disabling of the receivers is not possible. Use this switch only in an emergency or during servicing of the transmitter.

(2) Make certain that the transmitter control switch on Speech Amplifier BC–614–( ) is at TRANS-OFF. For Radio Transmitter BC–610–E this switch is located on Junction Box JB–70–A.

(3) Set FILAMENT POWER switch of the transmitter at ON. The green pilot lamp and the plate tuning dial should now light up, and the FIL. VOLTAGE meter should register.

(4) Adjust the FILAMENT VOLTAGE control on the transmitter panel until the FIL. VOLTAGE meter indicates 5 to 5.3 volts.

CAUTION: To prevent damage to the tube filaments, always allow a filament warm-up period of at least 30 seconds before applying plate power. Reread safety precaution (par. 19 *d* (1)) before proceeding further.

(5) Set the BAND SWITCH on the front panel of the transmitter so that its position number corresponds with the channel number where the tuning unit was placed.

(6) Set COUPLING control of Antenna Tuning Unit BC–729–(*) to the extreme left to decrease coupling to a minimum (Radio Transmitters BC–610–A through BC–610–D). Radio Transmitter BC–610–E is equipped with Antenna Tuning Unit BC–939–A.

(7) Set the CW-PHONE switch of the transmitter at CW.

b. Preliminary Checks. (1) *Overheating of parts.* Check the transmitter for smoke and odor of burned parts.

Note. Recently moistureproofed and fungiproofed equipment may give off a small amount of smoking which is usual.

(a) Tubes. After the transmitter has been operating for 5 minutes, remove all voltages. Immediately after removing plate voltage look for reddened plates within the envelopes of the large rectifier type tubes, as an indication of exceeding the normal plate dissipation. Feel the grid, plate, and filament terminals of the tubes for excessive heat due to contact resistance between the tube pin and socket connection.

CAUTION: Do not handle tubes that require heavy filament current or dangerously high plate voltage while the transmitter is in operation. Make the above checks after *all* voltages have been removed.

(b) Resistors. Watch for overheated or smoking resistors. Feel the tension of the ferrule clips. Insufficient tension of ferrule clips may cause poor electrical connection.

(c) Capacitors. Feel terminals and bodies of the capacitors for excessive heat.

(d) Transformers. Check transformers for signs of overheating.

(2) *Noises.* Listen for noises which indicate arcing.

(3) *Filament Voltage control.* If the FILAMENT VOLTAGE control on the transmitter cannot be adjusted for a reading of 5.0 to 5.3 volts on FIL. VOLTAGE meter, or if the meter shows no indication, make the following checks:

(a) Fuses. Make certain that all fuses are tight in their sockets and in operating condition.

(b) Source of power. Make certain that the cord and plug to the source of power are not defective. For detailed repair data on the internal power supplies see sections VI and VIII.

(c) Filament Power switch. Check this switch to determine whether or not it is operating properly.

(d) Voltage-regulater tubes. Make certain that tubes V13, V14, and V15 are firmly inserted in their sockets. The tube plates will show color when operating properly.

CAUTION: Touch only insulated parts. Use insulated probe to find loose joints and disconnected wires. Keep one hand behind the body when making these checks.

(4) If the above checks indicate that the transmitter is operating satisfactorily, proceed to make the subsequent tuning adjustments. If the operation of the transmitter fails during the tuning adjustments for c-w and voice transmission, see paragraph 22, and section VIII, for detailed repair data.

c. Master-oscillator (M.O.) Control for Radio Transmitters BC–610–A through BC–610–D.[1] Proceed as follows:

(1) Set M.O.—XTAL Switch of the tuning unit at M.O.

(2) Set the EXCITER PLATE POWER switch on the transmitter panel at ON. When operating Radio Transmitter BC–610–D, also throw the transmitter control switch of Speech Amplifier BC–614–( ) to TRANS. ON.

CAUTION: The door over the tuning units in the cover of the transmitter should be open at

[1]For performance characteristics of Radio Transmitters BC–610–A through –D see table VII.

this time to keep the high voltage from reaching the final amplifier.

(3) Set the P.A. GRID-INT. AMP. GRID meter switch on the front panel of the transmitter at P.A. GRID.

(4) Loosen the thumbscrew lock on the M.O. dial, and set this dial on the tuning unit to the desired frequency as indicated by the TUNING CHART of Radio Transmitters BC–610–A through BC–610–D, pertaining to the tuning unit in use. (See par. 40 b (3).) For greater accuracy use Frequency Meter Set SCR–211—( ) (par. 40). Tighten the dial lock.

(5) Press key J37. The transmitter may be keyed by using jack J101 on Speech Amplifier BC–614–( ). The key must be held down while making the subsequent tuning adjustments. Release except when actually making tuning adjustments.

(6) Adjust the center knob marked DOUB. on the tuning unit for maximum reading on the GRID CURRENT meter.

(7) Adjust the INT. AMP. knob of the tuning unit for the maximum deflection on the GRID CURRENT meter.

(8) Repeat steps in (6) and (7) above. The GRID CURRENT meter will indicate between 60 and 100 milliamperes.

(9) Throw the EXCITER PLATE POWER switch on the front panel of the transmitter OFF, and set the transmitter control switch of Speech Amplifier BC–614–D at TRANS. OFF. (See (2) above.)

(10) Close both cover doors. Make certain that both left and right hand doors on the top cover of the transmitter are firmly closed upon the interlock switches, otherwise plate power cannot be applied.

(11) Throw the HIGH VOLTAGE PROTECT switch up. Always do this before adjusting the P. A. PLATE wheel and the Antenna Tuning Unit BC–729–(*).

(12) Set the transmitter control switch on Speech Amplifier BC–614–( ) at TRANS. ON.

(a) The red pilot lamp should now light.

(b) The P.A. PLATE meter should indicate some current value depending upon the setting of the PLATE TUNING wheel.

(13) Unlock the PLATE TUNING wheel by pushing down on the small knurled knob, and adjust this wheel until the P.A. PLATE meter dips to a minimum reading. *Do not change this adjustment from this point on.*

(14) Lock the PLATE TUNING wheel by pushing the lock lever to the right.

(15) On Antenna Tuning Unit BC–729–(*):

(a) Set the SERIES COND. switch knob at 2–6 MC if operating below 6 MC, or to 6–8 MC if operating above 6 MC.

(b) Set the COUPLING knob to about the center of its scale.

(16) Ascertain from the tuning chart (par. 40 (3)), the approximate setting of the antenna loading inductor for the frequency which has been selected.

(17) Turn the antenna loading inductor crank to approach this setting and watch for an indication of rising final plate current at the P.A. PLATE meter.

(18) Adjust the crank for maximum current on the P.A. PLATE meter.

(a) If the value indicated on this meter exceeds 100 millamperes (ma), decrease the coupling by turning to the left the COUPLING knob on Antenna Tuning Unit BC–729–(*).

(b) If the value indicated on this meter falls below 100 ma, increase the coupling by turning the COUPLING knob to the right or in the INCREASE direction until it reaches 100 ma.

(c) The ANTENNA CURRENT meter of the antenna tuning unit will now give some indication of antenna current.

(19) Now throw the HIGH VOLTAGE PROTECT switch on the transmitter panel down to NORMAL. Both the P.A. PLATE current meter of the transmitter and the ANTENNA CURRENT meter of the antenna tuning unit will now indicate substantially higher readings.

(20) Adjust the COUPLING knob on the antenna tuning unit until the P. A. PLATE current meter reads 290 ma.

(21) Now carefully reset the inductor crank for maximum reading on the ANTENNA CURRENT meter.

(22) Readjust the COUPLING knob and the inductor crank by repeating the procedure specified in (20) and (21) above until maximum antenna current occurs when the P. A. PLATE meter reads 290 ma.

CAUTION: Never exceed a value of 300 ma indicated by the P.A. PLATE meter. It is permissible to reduce coupling so that the plate current is as low as 200 ma if satisfactory c–w communication is still maintained. Do not readjust the PLATE TUNING wheel after it is once adjusted. A check will show that it remains adjust-

ed if instructions have been followed. (See (13) above.)

(23) Release the key. With the opening of this key switch, the GRID CURRENT, P. A. PLATE, and ANTENNA CURRENT meters should all return to zero indication.

(24) Press Key J–37 and check the FIL. VOLTAGE meter. If necessary reset the FILAMENT VOLTAGE knob until this meter reads 5.0 to 5.3 volts; then release the key. The transmitter is now tuned and ready for c-w operation. Check the data on meter readings as specified in the table of performance characteristics. (See table VII.)

(25) To shut off the plate power, throw the transmitter control switch on the panel of Speech Amplifier BC–614–( ) to TRANS. OFF.

(26) To turn off the transmitter completely, set the FILAMENT POWER switch on the transmitter panel at OFF.

d. Master-oscillator (M. O.) Control for Radio Transmitter BC–610–E[1]. Proceed as follows:

(1) Set M. O. ITAL switch of the tuning unit to M. O.

(2) Set the EXCITATION METER SWITCH on the front panel of the transmitter at INT. AMP. GRID.

(3) Set the EXCITER PLATE POWER switch of the transmitter at ON.

CAUTION: The door over the tuning units in the cover of the transmitter should be open at this time to keep the high voltage from reaching the final amplifier.

(4) Loosen the thumbscrew lock on the M. O. dial and set this dial of the tuning unit to the desired frequency as indicated in the tuning chart of Radio Transmitter BC–610–E pertaining to the tuning unit in use. (See sec. IX.) For greater accuracy use Frequency Meter Set SCR–211–( ). (See par. 40.) Tighten the dial lock.

(5) Adjust the center knob marked DOUB. on the tuning unit for maximum reading as indicated on the EXCITATION METER.

(6) Set the EXCITATION METER SWITCH on the front panel of the transmitter at P. A. GRID.

(7) Adjust the INT. AMP. knob of the tuning unit for the maximum reading as indicated on the EXCITATION METER.

(8) Repeat steps specified in *d* (5) and *d* (7) above, until the maximum possible deflection is obtained on the EXCITATION METER. (EXCITATION METER will read between 60 and 100 ma.)

(9) Set the EXCITER PLATE POWER switch at NORMAL (OFF).

(10) Close both cover doors. Make certain that both left and right doors in the top cover of the transmitter are firmly closed upon the interlock switches, *otherwise plate power cannot be applied.*

(11) Throw the HIGH VOLTAGE PROTECT switch up. *Always do this before adjusting the P. A. PLATE wheel and the Antenna Tuning Unit BC–939–A.*

(12) Set the transmitter control switch on Junction Box JB–70–A at TRANS. ON. The red pilot light on the transmitter should now light.

(13) Close the circuit of Key J–37 by pressing the key. Jack J101 on Speech Amplifier BC–614–( ) may be used in keying. The key must be held down while making subsequent tuning adjustments. The P. A. PLATE meter should indicate some amount of current depending upon the setting of the PLATE TUNING wheel.

(14) Unlock the PLATE TUNING wheel by pushing down on the small knurled knob, and adjust this wheel until the P. A. PLATE meter dips to minimum reading. *Do not change this adjustment from this point on.*

(15) Lock the PLATE TUNING wheel by pushing the lock lever to the right.

(16) On Antenna Tuning Unit BC–939–A:

(a) Set the antenna range switch knob at 2–10 MC. position if operating below 10 MC. or at 10–18 MC. if operating above 10 MC.

(b) Set the COUPLING knob to about 2.0.

(17) Ascertain from the tuning chart (sec. IX), the approximate setting of the antenna tuning inductor for the frequency which has been selected.

(18) Turn the antenna tuning inductor crank to approach this setting and watch for an indication of rising current at the P. A. PLATE meter on the transmitter.

(a) If the operating frequency is in the range of 2–10 MC., use the crank marked "10 MC. — — 2 MC."

(b) If the operating frequency is in the range of 10–18 MC., use the crank marked "18 MC. — — 10 MC."

(19) Adjust the crank for maximum indica-

[1]For performance characteristics of Radio Transmitter BC–610–E see table VIII.

tion on the P. A. PLATE meter.

(a) If the value as indicated on this meter exceeds 100 ma., decrease the coupling by turning the COUPLING knob of BC–939–A to the left.

(b) If the value as indicated on this meter falls below 100 ma, increase the coupling by turning the COUPLING knob to the right, or in the INCREASE direction until it reaches 100 ma.

(c) The ANTENNA CURRENT meter BC–939–A will now give some indication of antenna current.

(20) Now throw the HIGH VOLTAGE PROTECT switch on the transmitter panel down to NORMAL. Both the P. A. PLATE current meter of the transmitter and the ANTENNA CURRENT meter of the antenna tuning unit will now indicate substantially higher readings.

(21) Adjust the COUPLING control of the antenna tuning unit until the P. A. PLATE meter reads 290 ma.

(22) Carefully reset the inductor crank for maximum reading on the ANTENNA CURRENT meter.

(23) Readjust the COUPLING control and the inductor crank by repeating the operations specified in (21) and (22) above, until maximum antenna current occurs when the P. A. PLATE meter reads 290 ma.

CAUTION: Never exceed a value of 300 ma. when operating on continuous wave as indicated by the P. A. PLATE current meter; it is permissible to reduce coupling so that plate current is as low as 200 ma if satisfactory c-w communication is still maintained. Do not readjust PLATE TUNING after once adjusted. A check will show that it remains approximately at minimum if instructions have been followed. (See (13) above.)

(24) Release Key J37. With the opening of this key, the EXCITATION, P. A. PLATE, and ANTENNA CURRENT meters should all return to zero indication.

(25) Press Key J–37 and check the FIL. VOLTAGE meter. If necessary reset the FILAMENT VOLTAGE knob until this meter reads 5.0 to 5.3 volts; then release the key. The transmitter is now tuned and ready for c-w operation. Check the meter readings with the data specified in the table of performance characteristics. (See table VIII.)

(26) To shut off the plate power, throw the transmitter control switch on the panel of Junction Box JB–70–A to TRANS. OFF.

(27) To turn off the transmitter completely, set the FILAMENT POWER switch on the transmitter panel at OFF.

e. Crystal-oscillator Control for Radio Transmitters BC–610–A through BC–610–D. Follow all the steps outlined in *a*(1) through (7) above, then proceed as follows:

(1) Set the M.O. –XTAL switch on the tuning unit at XTAL.

(2) Insert a crystal of proper frequency into the crystal jack of the tuning unit.

(3) Set the BUFFER-DOUBLER-INTERMEDIATE AMPLIFIER switch on the front panel of the transmitter to BUFFER-DOUBLER. On some earlier models this position of the switch was mistakenly marked OSCILLATOR. However, the current measured is that of the buffer-doubler stage.

(4) Set the EXCITER PLATE POWER switch of the transmitter at ON. When operating Radio Transmitter BC–610–D, also throw the transmitter control switch of Speech Amplifier BC–614–( ) to TRANS. ON.

CAUTION: The door over the tuning units in the cover of the transmitter should be open at this time to keep the high voltage from reaching the final amplifier.

(5) Set the P. A. GRID-INT. AMP. GRID meter switch on the front panel of the transmitter at P. A. GRID.

(6) Observe the reading on the EXCITATION PLATE meter to make sure that the crystal is oscillating. This meter will indicate approximately 40 to 50 ma when the crystal circuit oscillates.

(7) From here on, tune the transmitter by following the steps outlined in *c* above.

Note. Remember that within the 2 to 4 mc range the crystal frequency is the same as the transmitter output frequency, and that the circuit controlled by the DOUB. knob on the tuning unit then operates as a buffer stage. At all other times this stage acts as a doubler; hence the crystal frequency is one-half the output frequency when transmitting from 4 to 8 mc. Thus a crystal whose frequency is 2200 kc may be used with Tuning Unit TU-47 to produce the same frequency in the transmitter output; or it may be used with Tuning Unit TU-50 to operate the transmitter at 4,400 kc.

f. Crystal-oscillator Control for Radio Transmitter BC–610–E. Follow all the steps outlined in *a*(1) through (7) above, then proceed as follows:

(1) Set M.O.–XTAL switch of tuning unit at XTAL.

(2) Insert a crystal of proper frequency into the crystal jack of the tuning unit.

(3) Set EXCITATION METER SWITCH of the transmitter at INT. AMP. GRID.

(4) Set EXCITER PLATE POWER switch of transmitter at ON.

CAUTION: The door over the tuning units in the cover of the transmitter should be open at this time to keep the high voltage from reaching the final amplifier.

(5) From here on, tune the transmitter by following the steps as outlined in *d*(5) through (27) above.

Note: Remember that at frequencies from 2 to 4 mc. the crystal frequency is the same as the transmitter output frequency, and that the circuit controlled by the DOUB. knob on the tuning unit then operates as a buffer stage. From 4 to 12 mc this stage acts as a doubler; hence the crystal frequency is one-half the output frequency. Thus, a crystal whose frequency is 2,200 kc may be used with Tuning Unit TU-47 to produce the same frequency in the transmitter output; or it may be used with Tuning unit TU-50 to operate the transmitter on 4,400 kc. When operating at frequencies from 12 to 18 mc, the doubler stage quadruples the crystal frequency, and thus a crystal of 4,000 kc will produce a transmitter output frequency of 16,000 kc (16 mc).

g. Adjustments for Voice Transmission for Radio Transmitter BC–610–(*). To adjust Radio Transmitter BC–610–(*) for voice transmission, follow exactly all the operations outlined above for c-w operation. Make preliminary adjustments in accordance with *a*(1) through (7) above. For M.O. control follow *c*(1) through (6) above for BC–610–A through BC–610–D. Follow *d*(1) through (27) above for M.O. control of BC–610–E. For XTAL control follow *e*(1) through (7) above for BC–610–A through BC–610–D. Follow *f*(1) through (5) above for XTAL control of BC–610–E. Make sure that the transmitter control switch of Speech Amplifier BC–614–( ) is at TRANS OFF. When operating with Speech Amplifier BC–614–D, also make sure that the REMOTE TELEPHONE-NORMAL switch is at NORMAL for the following operations. When operating Radio Transmitter BC–610–E make sure that the transmitter control switch of Junction Box JB–70–A is at TRANS. OFF, the REMOTE CONTROL EE–8 switch is at NORMAL, and C.W. SIDETONE switch is at OFF.

(1) Set the MODULATOR BIAS control on the front panel of the transmitter to the extreme left. This setting increases the bias so that the MOD. PLATE meter will not indicate until further adjustments are made.

(2) Set the CW-PHONE switch on the transmitter panel at PHONE.

CAUTION: Never throw this switch while the final amplifier is turned on.

(3) Press the press-to-talk switch button on Microphone T–50–( ).

Note: This puts the transmitter carrier on the air. The P. A. PLATE meter should now read approximately 250 ma, which is the normal plate current for voice operation.

(4) Release the press-to-talk switch on the microphone.

CAUTION: Never exceed a value of 260 ma as indicated by the P. A. PLATE meter during voice operation. If the transmitter has been adjusted for a plate current of 290 ma on continuous wave, the plate current will drop to 250 ma when switched to voice operation since the CW-PHONE switch automatically reduces the final amplifier plate voltage. If the P. A. PLATE meter reads more than 260 ma, adjust the COUPLING control on the antenna tuning unit until the proper plate current is obtained.

(5) Hold the microphone in the left hand, press the press-to-talk switch, and with the right hand adjust the MODULATOR BIAS control on the front panel of the transmitter until the MOD. PLATE meter indicates 40 ma. Release the press-to-talk switch.

(6) Hold the microphone in a normal speaking position; press the press-to-talk switch, and speak into it at your normal voice level. Continue talking and make the following adjustments:

(a) Adjust the DYNAMIC MIC. GAIN control knob on Speech Amplifier BC–614–( ) until the OUTPUT LEVEL meter indicates approximately 0 decibel on voice peaks.

(b) Observe the MOD. PLATE meter. If its indicator swings higher than 200 ma on the extreme voice peaks, reduce the gain by turning the DYNAMIC MIC. GAIN control knob to the left. The 200-ma value represents approximately 100 percent modulation with the transmitter properly loaded.

(7) Releasing the press-to-talk switch button will now take the carrier off the air. The transmitter is ready for voice communication and should be controlled by the press-to-talk switch button on the microphone.

(8) To turn off the transmitter completely, set the FILAMENT POWER switch to OFF.

h. Changing the Type of Transmission. After the transmitter has been tuned for voice operation as outlined, it can be switched to c-w operation without further tuning adjustments by setting the CW-PHONE switch at CW and the transmitter control switch on Speech Amplifier BC–614–( ) at TRANS. ON. (For Radio Transmitter BC–610–E this switch is on Junction Box JB–70–A).

CAUTION: Never throw the CW-PHONE switch while the final amplifier plate power is on. The transmitter may be returned to voice operation again by setting the transmitter control switch at TRANS. OFF and switching the CW-PHONE switch to PHONE.

i. Changing Frequency.

(1) *Changing Frequency, Case 1.* The transmitter will accommodate three tuning units, each of which may be instantly selected by the BAND SWITCH. Each tuning unit may be tuned to a separate frequency, ready for use when needed. Since there are three complete sets of tuning units available, it is possible to install three tuning units of the same range, which can be covered by one coil unit. With each tuning unit pretuned to a different frequency within the range of the coil unit, change of the transmitting frequency would then be accomplished as follows:

(a) Set the transmitter control switch at TRANS. OFF, for c-w operation; or release the press-to-talk switch for voice operation.

(b) Reset the BAND SWITCH to the desired frequency.

(c) Throw the HIGH VOLTAGE PROTECT switch up.

(d) Set the transmitter control switch to TRANS. ON, and close the key for c-w, or press the press-to-talk switch for voice.

(e) Slightly retune the PLATE TUNING wheel for a minimum current reading on the P. A. PLATE METER.

(f) Adjust the antenna tuning unit inductor crank for a maximum current reading of the P. A. PLATE METER.

(g) Throw HIGH VOLTAGE PROTECT switch to NORMAL.

(h) Adjust the COUPLING control on the antenna tuning unit for a P. A. PLATE meter reading of 290 ma for c-w, or 250 ma for voice.

(i) Reset the inductor crank for a maximum reading on the ANTENNA CURRENT meter.

Note: When the change in frequency is small, only steps specified in (*a*), (*b*), and (*d*) above, may be necessary, but do not disregard the remaining steps.

(2) *Changing Frequency, Case 2.* When the three tuning units plugged into the transmitter cover two or more frequency ranges, it is necessary when switching from one frequency to another to observe these precautions:

(a) Before changing the BAND SWITCH setting to another channel, open the cover door over the coil unit compartment and determine whether or not the frequency range of the coil unit is correct. If not, remove it.

(b) Install the proper coil unit for the frequency selected.

(c) Close the cover door over the coil unit compartment.

(d) Set the BAND SWITCH to the desired channel.

(e) Assuming that the tuning unit has already been tuned up, and that the cover door over this compartment is closed, with key pressed tune the final amplifier and antenna circuits in the step by step procedure for c-w operation outlined above *a*(6) and *a*(7), *c*(11) through *c*(25), and *d*(11) through *d*(26); or throw the CW-PHONE switch to PHONE at the completion of retuning if voice operation is required.

(3) *Overload Reset Switch.* If the high voltage circuits are overloaded by excessive plate current plus heavy modulation, the overload relay will trip and shut off the plate power. When this occurs press the OVERLOAD RESET switch and continue with the transmission. If the overload persists, check the tuning adjustments and meter readings. For data on meter readings, see section VI.

(4) *Final Testing.* If the operation of the transmitter has been satisfactory, proceed to final testing. (See sec. VII.)

21. Neutralization.

If neutralizing capacitor C18 of Radio Transmitter BC–610–(*) has been tampered with, the unit will require readjustment. Proceed as follows:

a. Install Tuning Unit TU–52 and associated coil unit.

b. Disconnect from transmitter output terminals the two leads to the antenna tuning unit.

c. Set FILAMENT POWER switch at ON.

Note: In this operation high voltage plate power is not applied, so the transmitter control switch on the Speech Amplifier BC–614–( ) must be left at TRANS. OFF; the PLATE POWER switch on the transmitter is set at OFF. On Radio Transmitter BC–610–E the transmitter control switch is on Junction Box JB–70–A.

d. Set P. A. GRID-INT. AMP. GRID switch to P. A. GRID. (On Radio Transmitter BC–610–E set the EXCITATION METER SWITCH at P. A. GRID.)

e. Set EXCITER PLATE POWER switch to ON.

f. Adjust controls of the tuning unit to resonance at some frequency near the high-frequency end of the range.

g. Adjust PLATE TUNING wheel slowly through resonance. If neutralization is faulty, resonance will be indicated by a sharp dip in the reading of the GRID CURRENT meter.

h. Adjust neutralizing capacitor C18 little by little, checking after each adjustment, until rotating the PLATE TUNING wheel through resonance causes only a slight dip in the reading of the GRID CURRENT meter. When the neutralizing capacitor is properly adjusted this dip will not exceed 3 ma.

SECTION VI
DETAILED TROUBLE-SHOOTING PROCEDURES

22. Tests for Defective Stage.

If Radio Transmitter BC–610–(*) fails to operate correctly, follow the procedure outlined below for detailed trouble shooting. In any analysis of failure a step by step procedure is necessary, starting first with the source of energizing power, and then testing stage by stage through the r-f section, and then the modulator stages. In actual operation strict adherence to the values specified in the respective table is necessary for satisfactory results.

a. Power Supply. In trouble shooting, first check the power supply to determine whether or not the correct voltages are available. Verify proper connection between transmitter socket SO6 and the external alternating-current (a-c) source, checking the socket, and power cable and plug. If necessary, check the internal power supplies in accordance with the special repair data given in *d*(1), (*a*), *e*(6), *f*(3) and *g* below and in paragraphs 29, 32, and 33.

b. Meter Readings. A check of the meter readings aids in recognizing faulty operation of the transmitter, and a logical interpretation of the meter indications, combined with a circuit analysis, will aid in localizing the source of failure.

(1) Compare the meter current readings with those indicated in table VII, or table VIII, depending on the model of the transmitter under test.

Table VII. Performance Characteristics for Radio Transmitters BC–610–A Through BC–610–D

Description	Indicating meter	Meter switch position	Normal	Limits	
				Max	Min
Line voltage (a-c)			115 v	125 v	105 v
Filament voltage	FIL. VOLTAGE		5.0 v	5.3 v	4.9 v
Buffer-doubler plate current	EXCITATION PLATE	BUFFER-DOUBLER	35 ma		25 ma
Intermediate amplifier grid current	GRID CURRENT	INT. AMP. GRID	3 ma	8 ma	2 ma
Intermediate amplifier plate current	EXCITATION PLATE	INTERMEDIATE AMPLIFIER	150 ma	175 ma	
P. A. grid current (PLATE POWER OFF)	GRID CURRENT	P. A. GRID	75–100 ma		60 ma
P. A. grid current (PLATE POWER ON)	GRID CURRENT	P. A. GRID	65–80 ma		50 ma
P. A. plate current (PHONE)	P. A. PLATE		250 ma	260 ma	200 ma
P. A. plate current (c-w)	P. A. PLATE		290 ma	300 ma	200 ma
Mod plate current (no mod)	MOD. PLATE		40 ma	50 ma	35 ma
Mod plate current (100% mod)	MOD. PLATE		200 ma		
Power output (voice)			320 watts		210 watts
Power output (c-w)			500 watts		325 watts
Input level to BC–614–(*) (max gain) for 100% mod			46 db below 1.73 v		40 db below 1.73 v
Hum level			40 db below 100% mod		35 db below 100% mod

Note. Normal readings are subject to some variation. However, the maximum and minimum limits should not be exceeded.

Table VIII. Performance Characteristics of Radio Transmitter BC–610–E

Description	Indicating meter	Meter switch position	Normal	Limits	
				Max	Min
Line voltage (a-c)			117 v	125 v	105 v
Filament voltage	FIL. VOLTAGE		5.0 v	5.3 v	4.9 v
Doubler-buffer plate current	EXCITATION METER	DOUBLER PLATE	35 ma		25 ma
Intermediate-amplifier grid current	EXCITATION METER	INT. AMP. GRID	2 ma	8 ma	1 ma

Table VIII. Performance Characteristics of Radio Transmitter BC–610–E—Continued

Description	Indicating meter	Meter switch position	Normal	Limits	
				Max	Min
Intermediate-amplifier plate current	EXCITATION METER	INT. AMP. PLATE	150 ma	175 ma	
P. A. grid current (PLATE POWER OFF)	EXCITATION METER	P. A. GRID	75–100 ma		60 ma
P. A. grid current (PLATE POWER ON)	EXCITATION METER	P. A. GRID	65–80 ma		50 ma
P. A. plate current (PHONE)	P. A. PLATE		250 ma	260 ma	200 ma
P. A. plate current (c-w)	P. A. PLATE		290 ma	300 ma	200 ma
Mod plate current (no mod)	MOD. PLATE		40 ma	50 ma	35 ma
Mod plate current (100% mod)	MOD. PLATE		200 ma		
Power output (voice) (4 mc)			320 watts		210 watts
Power output (c-w)			500 watts		325 watts
Input level to BC–614–E (max gain) for 100% mod			46 db below 1.73 v		40 db below 1.73 v
Hum level			40 db below 100% mod		35 db below 100% mod

Note. Normal readings are subject to some variation. However, the maximum and minimum limits should not be exceeded.

(2) See table IX, for a listing of typical failures as indicated by the meters, and the probable causes of these failures.

(3) Correct errors in tuning and make necessary repairs and replacements.

(4) See below in this section to the detailed repair data for the defective stage.

Note. If fuses continue to burn out each time the transmitter is turned on, insert an electric lamp in place of the fuse and check to determine the defect in the circuit.

Table IX. Typical Failures in Operation and Their Probable Causes

Typical failure	Probable cause
No filament voltage in Radio Transmitter BC–610–(*).	One or all fuses FS1, FS2, FS4 and FS5 are burned out. Defective FILAMENT POWER switch. Defective filament resistor R18. Damaged power cord or poor plug contacts. V13, V14, and V15 are not in their sockets.
No excitation indicated on P. A. GRID CURRENT meter of Radio Transmitter BC–610–(*). (EXCITATION meter on Radio Transmitter BC–610–E.)	Tuning unit improperly installed or missing. BAND SWITCH not set to proper channel. M.O.–XTAL switch on coil box in wrong position. Failure in keying circuits. Fuse FS4 burned out. Omission of or defective tubes on exciter deck. Open r-f choke, CH8. EXCITER PLATE POWER switch not turned on for tune-up purposes. Tuning unit not properly tuned.

Table IX. Typical Failures in Operation and Their Probable Causes—Continued

Typical failure	Probable cause
No final amplifier plate current indicated on the P.A. PLATE meter of Radio Transmitter BC–610–(*) (assuming that the necessary P.A. grid current is present).	"Reset" necessary on overload relay. One or all fuses FS1, FS2 and FS3 burned out. Interlock switches are not all closed due to faulty closing of door if back screen has not been removed. Short circuit in high voltage circuit continually tripping out the overload relay. Poor or no cable connection with Speech Amplifier BC–614–(*). Rectifier tubes (VT–46–A) defective or inoperative due to extreme cold. Missing output coil unit, L7. It may be improperly installed on jack bar. V6 and V7 plate caps removed. 600-watt heater element used for tuning up on low power is defective or missing. (See R19.)
Excessive power amplifier plate current indicated on the P. A. PLATE meter of Radio Transmitter BC–610–(*).	R-f choke CH8 is open. Improper tuning of output circuit, for example, wrong coil unit, L7; failure to use vacuum capacitor C28 below 2.5 mc; etc. Too much antenna coupling. Grid cap on V16 is loose or removed. No bias voltage due to blown fuse, FS5, or defective rectifier, V5. Voltage breakdown between center tap of L7 and the coupling link.

Table IX. Typical Failures in Operation and Their Probable Causes—Continued

Typical failure	Probable cause
Plate voltage of Radio Transmitter BC–610–(*) final amplifier remains on after being switched off.	Relay RY4, has frozen during a *severe* overload. ***CAUTION:*** Leave plug out of socket PL6 on SO6 BC–610–E while working on this relay.) Fuse FS5 blown.
Excessive modulator plate current indicated on MOD. PLATE meter of Radio Transmitter BC–610–(*).	Improper adjustment of the bias voltage controlled by the MODULATOR BIAS control on the front panel. Acoustical feedback caused by GAIN control on Speech Amplifier BC–614–(*) advanced too far. Grid caps of V3 and V4 are disconnected. Lack of bias voltage because of defective tube V5 or blown fuse FS5.
No antenna current indicated on ANTENNA CURRENT meter of Antenna Tuning Unit BC–729–(*) or BC–939–A.	Incorrect control settings. (See tuning charts.) Sections of transmitting antenna missing. Coupling coil too loosely coupled to L5 in the antenna tuner. Grounding bonds disconnected. Vacuum capacitor shorted out by the change-over switch if operating above 6 mc; or not shorted out if operating below 6 mc.
Microphone PRESS-TO-TALK switch fails to operate.	The 12-volt battery not connected. Poor or broken microphone connection to Speech Amplifier BC–614–( ). Faulty switch inside the microphone.

Note. Normal readings are subject to some variation. However, the maximum and minimum limits should not be exceeded.

c. Tube Testing. Although the tubes were tested prior to operation (par. 15*c*), they may prove to be faulty later during operation because of a change in conditions. Therefore to make certain that the tubes are not a source of trouble perform the trial substitution test (par. 15 *c*(1) *(d)*) on each tube beginning with the oscillator and continuing through each successive stage, or test with an ohmmeter between the filaments and the other elements within the envelope of the tube.

d. Voltage and Resistance Tests. Voltage and resistance tests aid in disclosing defects in the circuit. Perform the tests as follows:

(1) *Voltage tests. (a) Voltage tests from the power supplies.* Test the voltage from the power supply at each section to determine whether or not the action is receiving the required voltage. This should include a check of plate voltage, shield grid voltage, bias voltage, and filament voltage taken directly at the terminal strip for each section. See figures 34, 35, 36 and 37 depending on the model of the transmitter under test. Use Analyzer BC–1052–E (or equivalent) for these tests. If these tests indicate normal values, proceed to make voltage tests at the socket terminals of the stage under question.

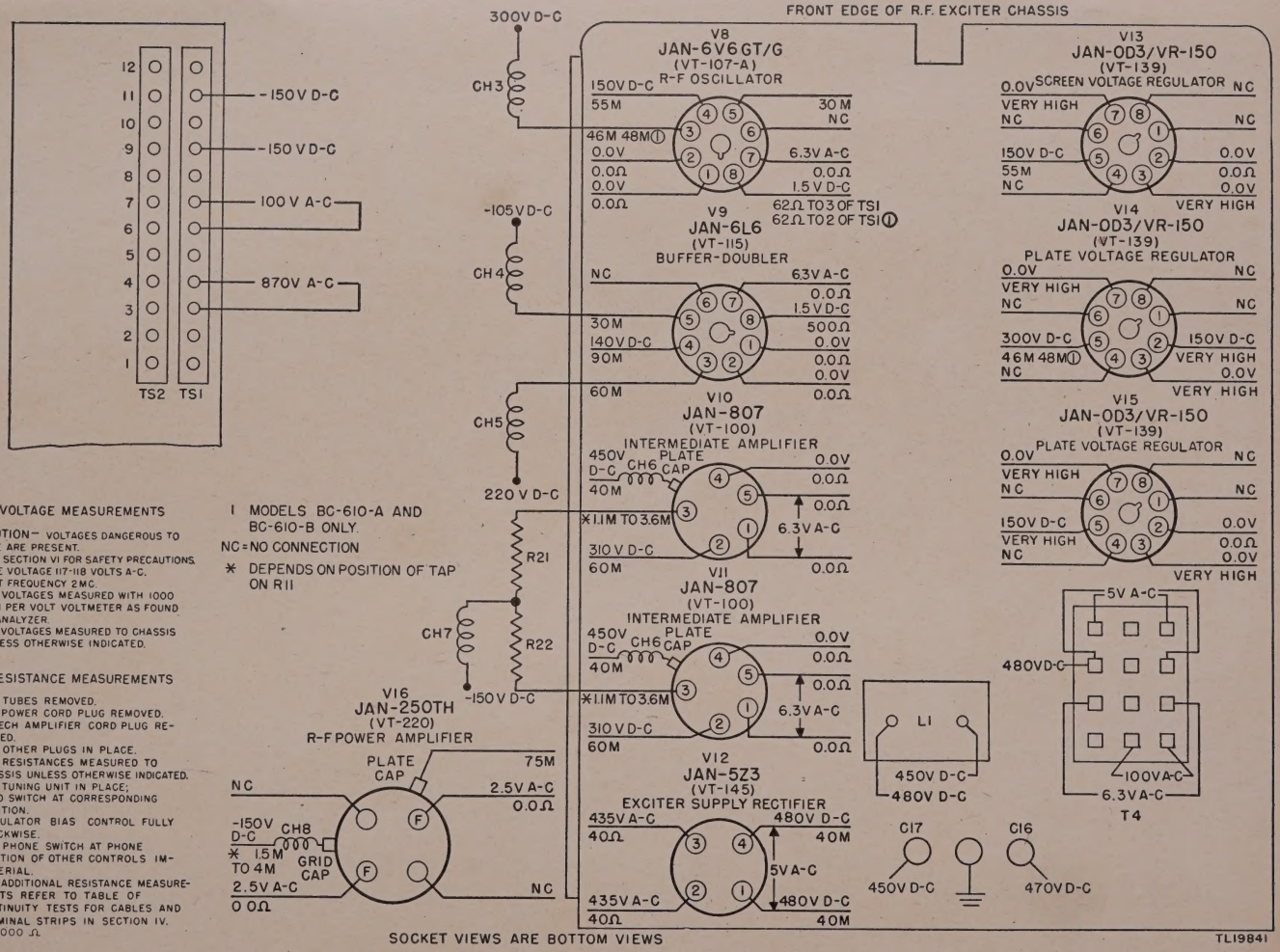
(b) Voltage tests at the socket terminals. Test voltages at the socket terminals in an effort to ascertain the defective part within the stage. These voltage values should be as specified on the chassis layout diagrams. (See figs. 17 through 25.) The voltage measurements shown on the chassis lay-out diagrams are made between the pin connections to the tube and chassis ground. These values are approximate and will vary slightly with different transmitters and with measuring equipment of different meter sensitivity. Adhere to these values within a tolerance of plus or minus 10 percent. The voltage measurements presented are those of normal operation.

WARNING: Do not change fuses or make repairs with the high voltages on, because under this condition a potential of 2,000 to 2,500 volts direct current is present on all three decks of the transmitter. Exercise all reasonable precaution when making d-c voltage tests.

(c) General instructions for the use of Analyzer BC–1052–E (or equivalent) for voltage measurements.

1. Connect the transmitter for c-w operation.
2. To prevent damaging the instrument by an overload, begin measurements with the highest range whenever approximate voltage, current, or db level is not known.
3. See voltmeter chart (accompanying the voltmeter) for the correct settings of controls, switches, jacks, and test prods before making any measurements.
4. The DECIBEL calibration is for use across 500-ohm lines and loads. The scale is read directly in db.
5. The OUTPUT jacks are for measuring the voltage or db level of any a-c or audio voltage. Internal circuits are made through a 0.1– microfarad (mf) isolating capacitor inside the instrument so that alternating current or audio superimposed on a d-c voltage may be read without harm to the analyzer.

(d) Instructions for use of Analyzer BC–1052–E (or equivalent) for high-voltage measurement.



VOLTAGE MEASUREMENTS

CAUTION— VOLTAGES DANGEROUS TO LIFE ARE PRESENT.
SEE SECTION VI FOR SAFETY PRECAUTIONS.
LINE VOLTAGE 117-118 VOLTS A-C.
TEST FREQUENCY 2 MC.
ALL VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOLTMETER AS FOUND IN ANALYZER.
ALL VOLTAGES MEASURED TO CHASSIS UNLESS OTHERWISE INDICATED.

RESISTANCE MEASUREMENTS

ALL TUBES REMOVED.
A-C POWER CORD PLUG REMOVED.
SPEECH AMPLIFIER CORD PLUG REMOVED.
ALL OTHER PLUGS IN PLACE.
ALL RESISTANCES MEASURED TO CHASSIS UNLESS OTHERWISE INDICATED.
ANY TUNING UNIT IN PLACE; BAND SWITCH AT CORRESPONDING POSITION.
MODULATOR BIAS CONTROL FULLY CLOCKWISE.
C-W PHONE SWITCH AT PHONE POSITION OF OTHER CONTROLS IMMATERIAL.
FOR ADDITIONAL RESISTANCE MEASUREMENTS REFER TO TABLE OF CONTINUITY TESTS FOR CABLES AND TERMINAL STRIPS IN SECTION IV.
M=1,000 Ω

① MODELS BC-610-A AND BC-610-B ONLY.
NC=NO CONNECTION
* DEPENDS ON POSITION OF TAP ON R11

Figure 17. Radio Transmitters BC-610-A, BC-610-B, and BC-610-C, chassis lay-out diagram showing voltages and resistances of r-f section.

WARNING: It is EXTREMELY DANGEROUS to make this measurement. The high voltage in Radio Transmitter BC–610–(*) is deadly. When making this test, always arrange to have someone else present.

The recommended procedure for measuring the high voltage is as follows:

1. Insulate the voltmeter well above ground by placing it on dry boards or other insulating material at least 1 inch thick.
2. Set the voltmeter controls to the proper positions for measuring 3,000 volts direct current as indicated on the voltmeter chart.
3. Remove coil unit L7.
4. Place red (positive) test lead prod into center jack of jack bar of the coil unit.
5. Connect black (negative) test lead to any convenient ground on the transmitter frame.
6. Open right-hand cover door (over tuning boxes or units) to open its interlock switch. (This switch will be used to close the circuit in step *13* below.)
7. Fasten down the interlock switch at the left-hand cover door so its circuit is closed.
8. See that back screen is in place so that its interlock switch is closed.
9. Arrange the red (positive) test prod with cord so that it is extremely well insulated. It should be carefully supported, free and clear from the door and frame of the transmitter and any components.
10. STAND CLEAR OF THE RED (POSITIVE) TEST LEAD, AND SEE THAT NEITHER YOU NOR OTHER PERSONNEL COME IN CONTACT WITH IT WHEN VOLTAGE IS ON.
11. Set PLATE POWER switch of transmitter at ON.
12. PUT YOUR LEFT HAND IN YOUR POCKET.
13. With your right hand, turn on the high voltage by pressing the interlock switch at the right-hand cover door.
14. Read the voltage indication on the voltmeter and release the interlock switch.
15. Set PLATE POWER switch to OFF and remove fastening from left-hand cover interlock when finished.

(2) *Resistance tests.* If the voltage values are not as specified in figures 17 through 25, use an ohmmeter to perform the following resistance tests using Analyzer BC–1052–E (or equivalent). Make these tests with voltages removed.

(a) Make d-c resistance tests between each terminal of the socket and chassis ground to ascertain any change in the electrical characteristics of the component parts within the stage. Check these resistance readings with the values specified on the chassis lay-out drawings. (See figs. 17 through 25.)

(b) If the resistance values are normal, make the circuit continuity tests between the cables and terminal strips in accordance with table IV in order to discover possible broken leads and poorly soldered joints. Dress and resolder leads if necessary. See the practical wiring diagram for the particular section in question. (See figs. 47, 48, 49, 50, and 51.)

(c) If the resistance values between chassis ground and socket terminal within the stage are not as required, make d-c resistance tests of the component parts within the defective stage, (*e, f,* and *g* below and sec. VIII), to locate the defective part. If the value for any part is not as required, replace the defective part.

(d) Use of Analyzer BC–1052–E (or equivalent) for resistance measurements.

1. Remove all tubes
2. Remove a-c power plug from transmitter socket PL6 (SO6 on Radio Transmitter BC–610–E).
3. Remove Speech Amplifier BC–614–( ) plug from socket PL5 (SO5 on Radio Transmitter BC–610–E).
4. Leave all other plugs in place.
5. With any tuning unit in place, set the BAND SWITCH at the correct corresponding position.
6. Turn MODULATOR BIAS control fully clockwise.
7. Set CW-PHONE SWITCH at PHONE.
8. Set the analyzer switches and make test prod connections as indicated in the chart for the range into which the resistor falls.
9. Short the test prods and adjust the meter for full scale deflection (zero ohm) by use of OHMS ADJUST knob.
10. Touch the test prods to the ends of the resistor, at least one end of which should be disconnected from the circuit.
11. Read the ohms on the OHMS scale, and multiply that reading by the value indicated on the ohms range on the rotary selector switch.

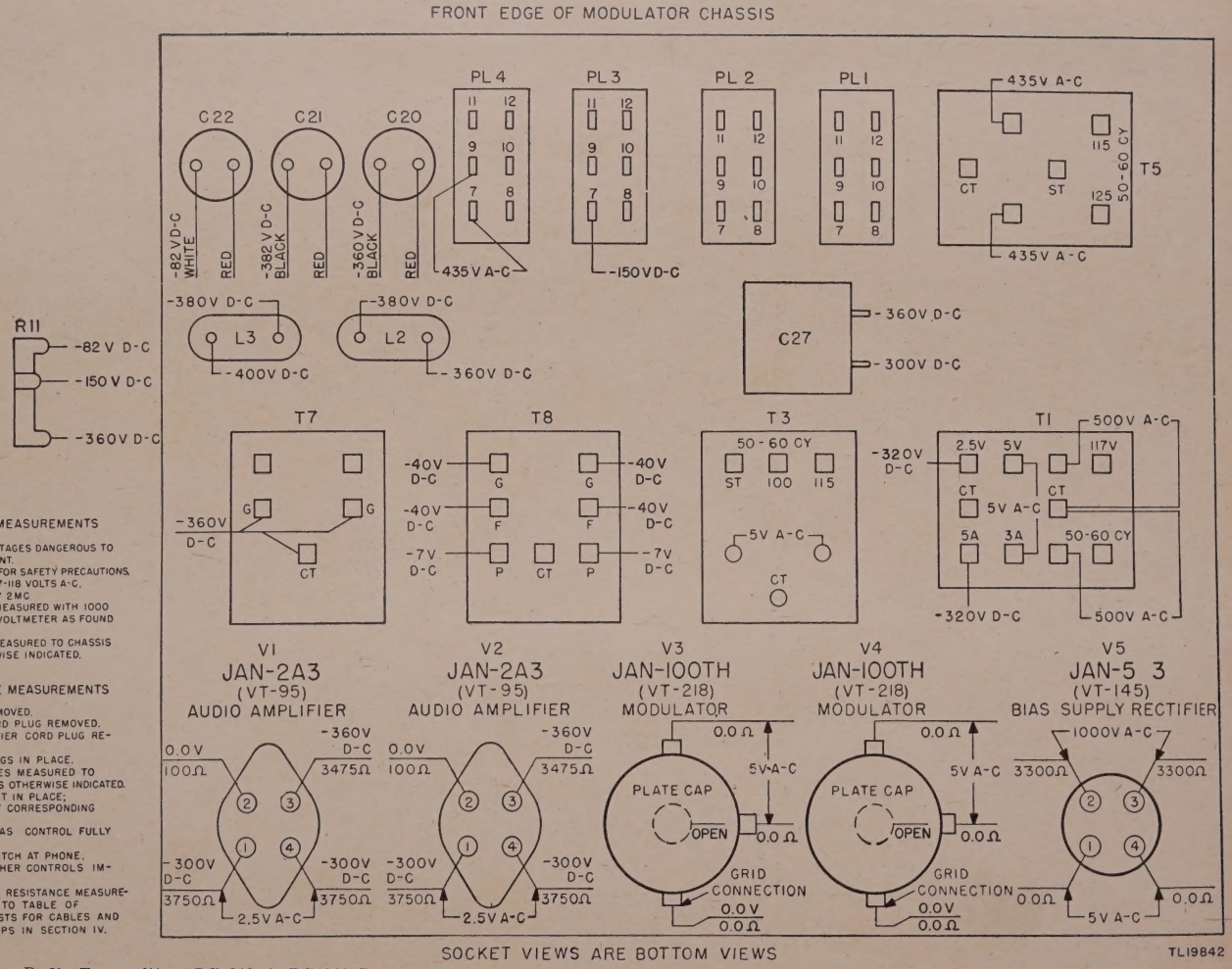


Figure 18. Radio Transmitters BC-610-A, BC-610-B, and BC-610-C, chassis lay-out diagram showing voltages and resistances of modulator section.

Note: The OHMS adjustment must be made every time the range switch is changed from one range to another.

e. Special Tests and Repairs for R-f Stages. (1) *R-f Oscillator stage.* If the r-f oscillator (master-oscillator control or crystal control) does not develop sufficient oscillation to excite the r-f buffer-doubler stage, make the following tests. For other repair features see paragraph 25, and figure 28.

(a) Correct frequency of crystal. Make certain that the frequency value of the crystal is correct for the operating frequency for the tuning unit involved. (See par. 40 *b*(4).) Check the tuning unit. If it is defective, replace it.

(b) Proper function of crystal. 1. Fractured crystal. Make an operational check to determine that the crystal is not fractured, and is in good operating condition. Do this by substituting a known good crystal unit for the one in the tuning unit and comparing the performance of the transmitter.

2. Jack condition. Inspect the jack to determine the presence of surface to surface contact.

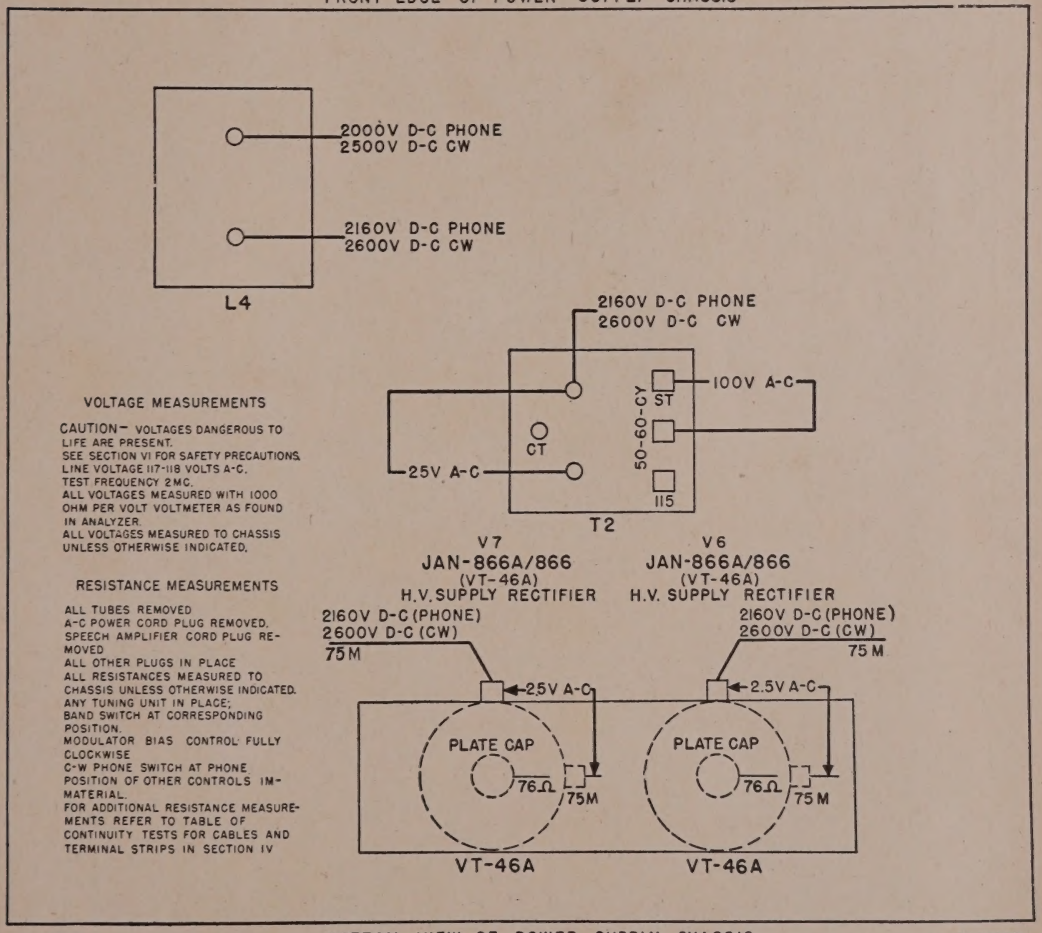


Figure 19. Radio Transmitters BC–610–A, BC–610–B, and BC–610–C, chassis lay-out diagram showing voltages and resistances of power supply.

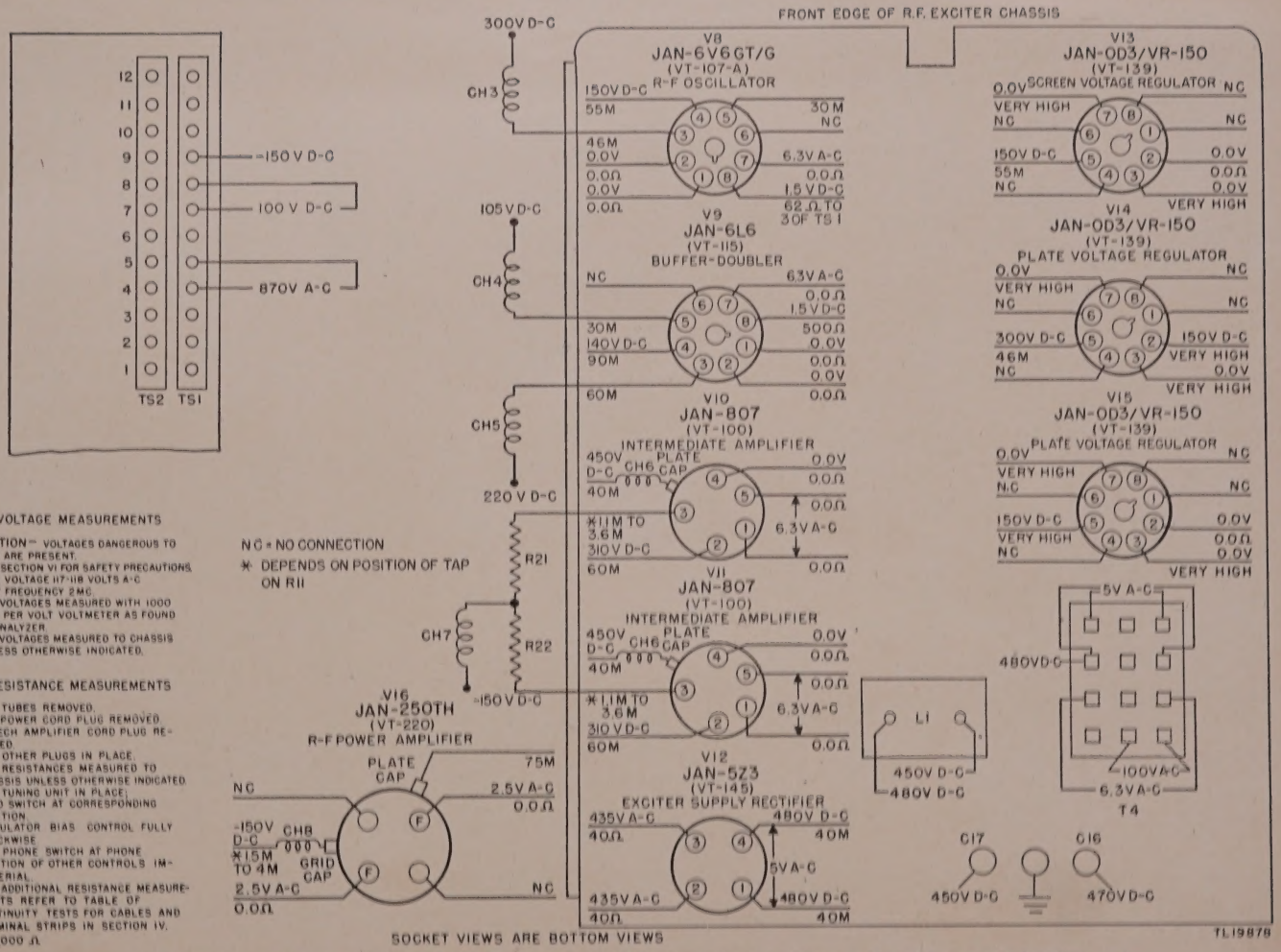
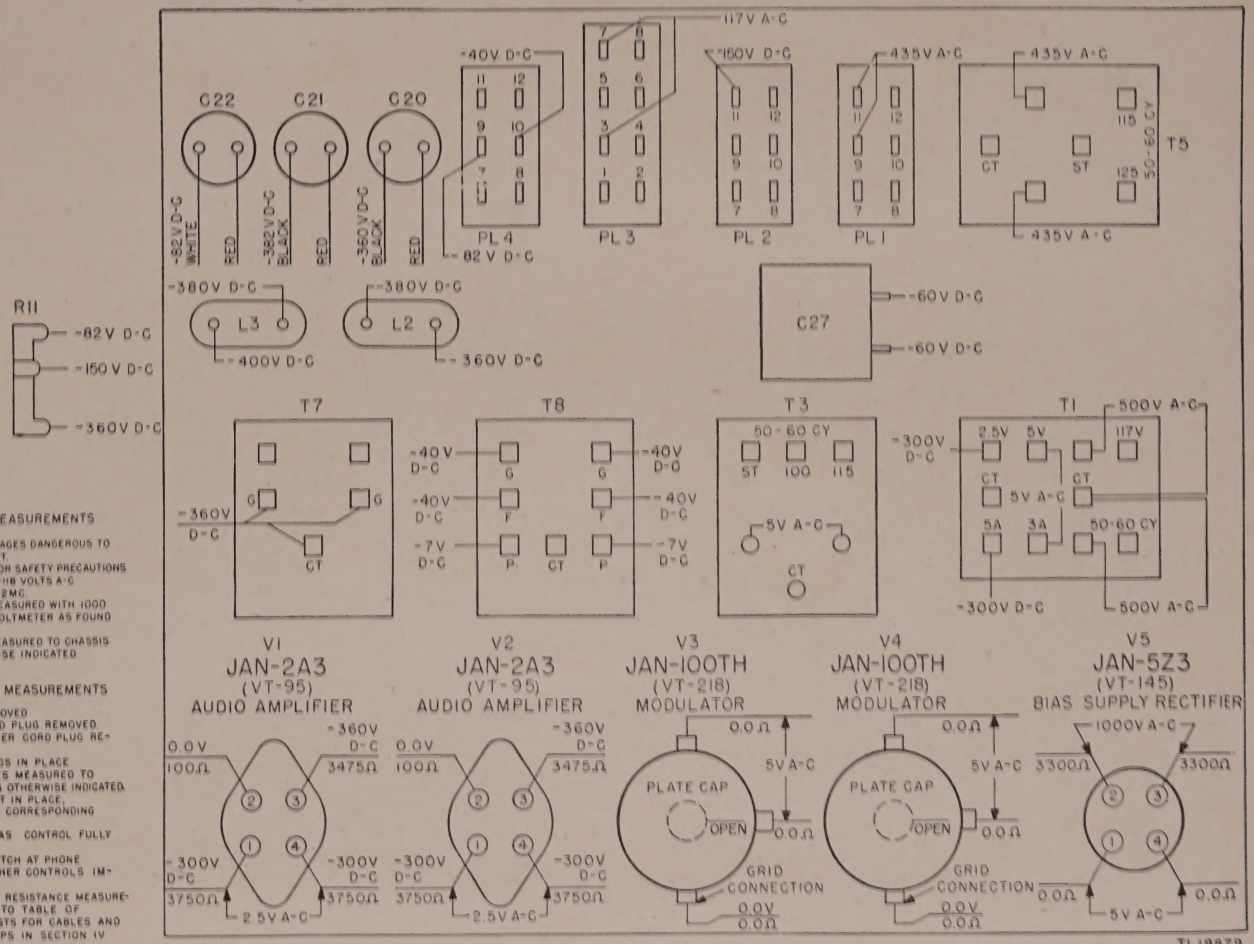


Figure 20. Radio Transmitter BC-610-D, chassis lay-out diagram showing voltages and resistances of r-f section.



VOLTAGE MEASUREMENTS

CAUTION: VOLTAGES DANGEROUS TO LIFE ARE PRESENT. SEE SECTION VI FOR SAFETY PRECAUTIONS.
LINE VOLTAGE 117-118 VOLTS A-C
TEST FREQUENCY 2MC.
ALL VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOLTMETER AS FOUND IN ANALYZER.
ALL VOLTAGES MEASURED TO CHASSIS UNLESS OTHERWISE INDICATED.

RESISTANCE MEASUREMENTS

ALL TUBES REMOVED.
A-C POWER CORD PLUG REMOVED.
SPEECH AMPLIFIER CORD PLUG REMOVED.
ALL OTHER PLUGS IN PLACE.
ALL RESISTANCES MEASURED TO CHASSIS UNLESS OTHERWISE INDICATED.
ANY TUNING UNIT IN PLACE, BAND SWITCH AT CORRESPONDING POSITION.
MODULATOR BIAS CONTROL FULLY CLOCKWISE.
C-W PHONE SWITCH AT PHONE POSITION OF OTHER CONTROLS IMMATERIAL.
FOR ADDITIONAL RESISTANCE MEASUREMENTS REFER TO TABLE OF CONTINUITY TESTS FOR CABLES AND TERMINAL STRIPS IN SECTION IV.

SOCKET VIEWS ARE BOTTOM VIEWS

TL19879

Figure 21. Radio Transmitter BC-610-D, chassis lay-out diagram showing voltages and resistances of modulator section.

(c) Keyer circuit continuity. Inspect the cordage, plugs, and terminal strip. (See table IV.)

(d) BAND SWITCH. Inspect sections SW11.1 and SW11.2 of BAND SWITCH for defective operation. Clean and adjust the contacts.

(e) Frequency check. Use an absorption frequency meter or Frequency Meter Set SCR–211–( ) to determine whether or not the circuit is oscillating with the switch at XTAL or at M. O. (See par. 40.) If the frequency meter gives an indication that the oscillator stage is oscillating, then measure the voltage across resistor R1. This voltage value should be not less than 10 volts direct current for normal oscillator function. If a reading of less than 10 volts is obtained, make the tests listed below. (See par. 25, and fig. 28, for other repair features.)

1. Turn off all power and test with an ohmmeter:

a. Chokes CH1, CH2, CH3, and CH9 for open circuits.

b. Resistors R1, R2, and R3 for open circuits and correct values ± 10 percent.

c. Capacitors C1, C2, C3, C5, and C13 for shorts, leakage and correct values ± 10 percent. A capacitor bridge may be used to test the value of the capacitors.

2. Replace the defective parts.

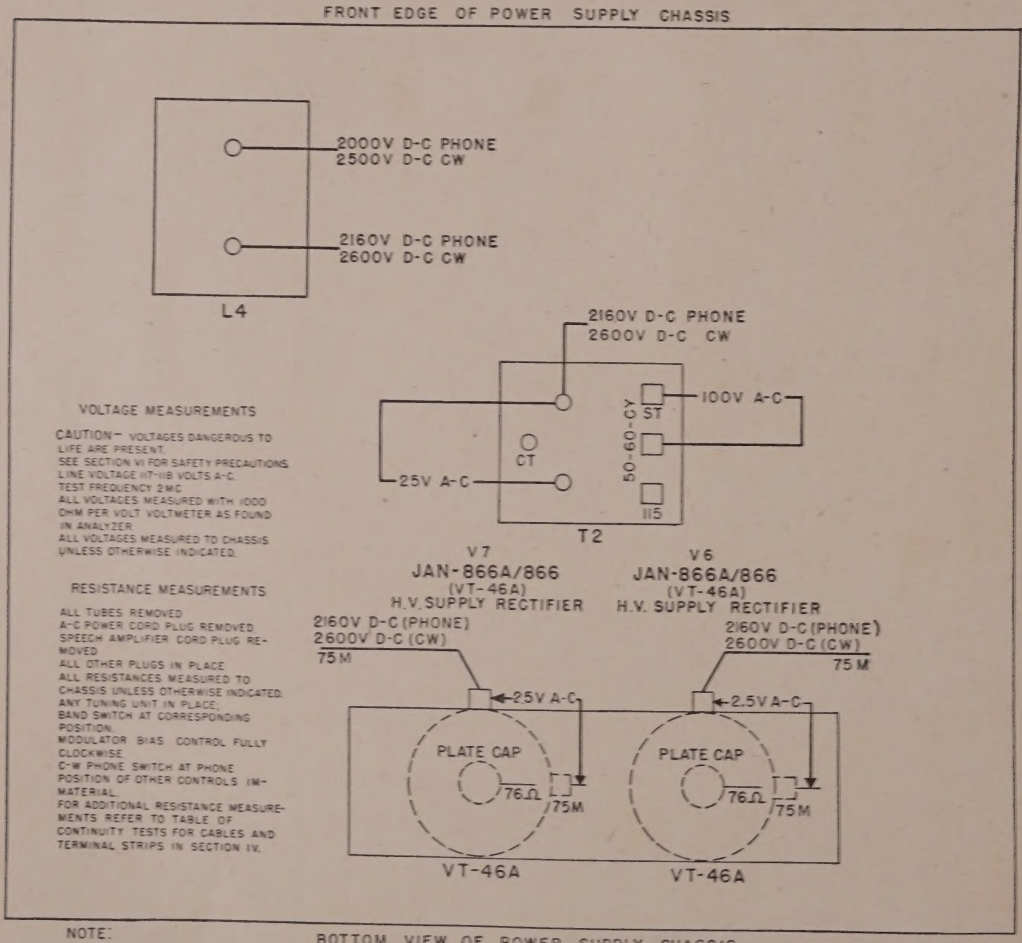


Figure 22. Radio Transmitter BC–610–D, chassis lay-out diagram showing voltages and resistances of power supply.

(2) *R-f Buffer-doubler stage.* If the r-f buffer-doubler does not supply sufficient excitation to the r-f intermediate amplifier, make the tests listed below. (For other repair features see par. 26, and fig. 21.)

(a) Turn off the power and test with an ohmmeter:

1. Chokes CH4 and CH5 (CH4 is not present on BC–610–E), for open circuits.
2. Resistors R23, R24, R25, and R28 (R28 not present on BC–610–E) for open circuits and correct values ± 10 percent.
3. Capacitors C8 and C14 for short circuits leakage, and correct values ± 10 percent. A capacitor bridge may be used to test the value of the capacitors.

(b) Replace the defective parts.

(3) *R-f Intermediate amplifier stage.* If the r-f intermediate amplifier does not supply sufficient excitation to the r-f power amplifier, or if its behavior is erratic, make the tests below. (For other repair features see par. 27, and fig. 30.)

(a) Turn off the power and test with an ohmmeter:

1. Chokes CH6 and CH7 for open circuits.
2. Resistors R6, R7, R21, and R22 for open circuits and correct values ± 10 percent.
3. Capacitors C6, C7, and C15 for shorts, leakage, and correct values ± 10 percent. A capacitor bridge may be used to test the value of the capacitors.

(b) Replace the defective parts.

(4) *R-f Power amplifier stage.* If the r-f power amplifier does not operate satisfactorily as indicated by the meter readings, make the tests listed below. (For other repair features see par. 28, and fig. 31.)

(a) Close switch SW7 to determine whether or not relay RY3 is operating.

(b) Check the electrical characteristics of relays RY3 and RY4 (figs. 57 and 58) for possible defects such as an open coil, improper spring tension, spacing between contacts, and contact pressure.

(c) Check for loose connections and broken leads at switch SW7 and relays RY3 and RY4.

(d) Make a continuity test of switch SW7 to determine whether it is effective in the circuit. Make certain that the contacts engage and that the plunger is operative. Since this switch is the inclosed type, if it is defective it must be replaced with one of the same type.

(e) With the power off test with an ohmmeter:

1. Chokes CH8 and CH10 for an open circuit.
2. Resistors R8 and R9 for open circuits and correct values ± 10 percent.
3. Capacitors C11 and C29 for shorts, leakage, and correct values ± 10 percent. A capacitor bridge may be used to test the value of the capacitors.

(5) *Antenna-tuning unit.* If the r-f power in the dummy antenna or the antenna tuning unit is not as required, make the checks listed below. (For other repair features, see pars. 36 and 37, and figs. 40 and 41.)

(a) Check the tuning of each of the stages for resonance. (See par. 20.)

(b) Check the output frequency of the transmitter. (See par. 40.)

(c) Check the appropriate tuning chart (sec. IX) to make certain that the tuning unit or tuning box and associated coil unit being used is the proper one for the desired frequency.

(d) Make certain that tuning control settings are in accordance with the appropriate tuning chart. (See sec. IX.)

(e) Check the neutralization. (See par. 21.)

(f) Check BAND SWITCH SW11 for circuit continuity. Look for rosin points, poorly soldered leads, or broken connectors to the switch. Resolder to insure continuity.

(6) *R-f Power supply.* If the required voltages are not obtained from the r-f power supply, make the tests listed below. (For other repair features see par. 29 and fig. 32.)

(a) Turn off all power and test with an ohmmeter:

1. Transformers T4 and T5 for and open or shorted primary or secondary winding.
2. Filter reactor L1 for a short circuit.
3. Filter capacitors C16 and C17 for short circuits.
4. Resistors R4 and R10 for open circuits.

(b) Replace the defective parts.

(c) See input and output resistance tests. (See pars. 16*a*(3) and 16*b*(3).)

f. Special Tests and Repairs for Modulator Stages. (1) *Modulator stage.* If the normal value of modulator plate current (35 to 50 ma) (no modulation) cannot be obtained, make the tests listed below. (For other repair features see par. 30, and fig. 33.)

(a) Turn off the plate power and test with an ohmmeter:

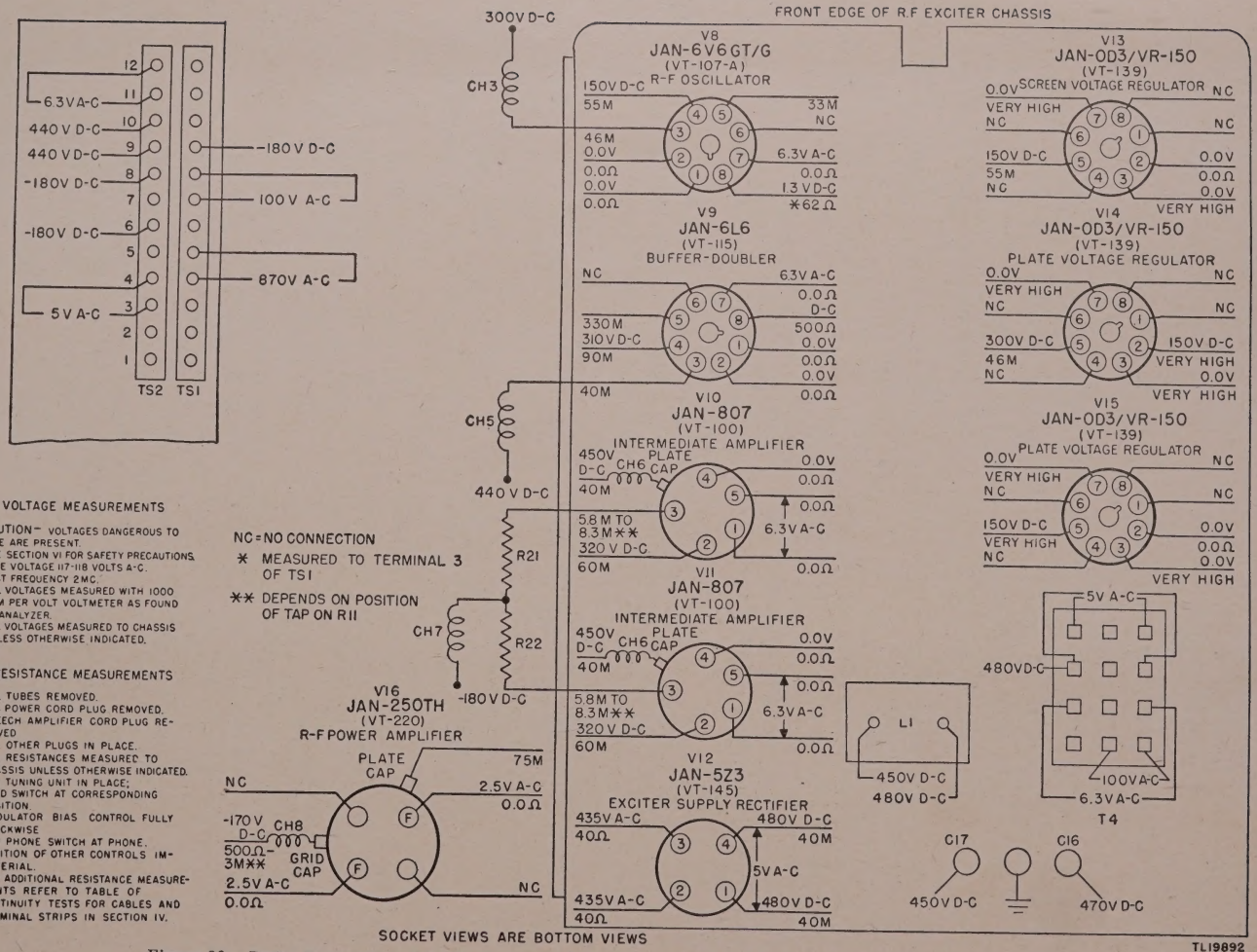
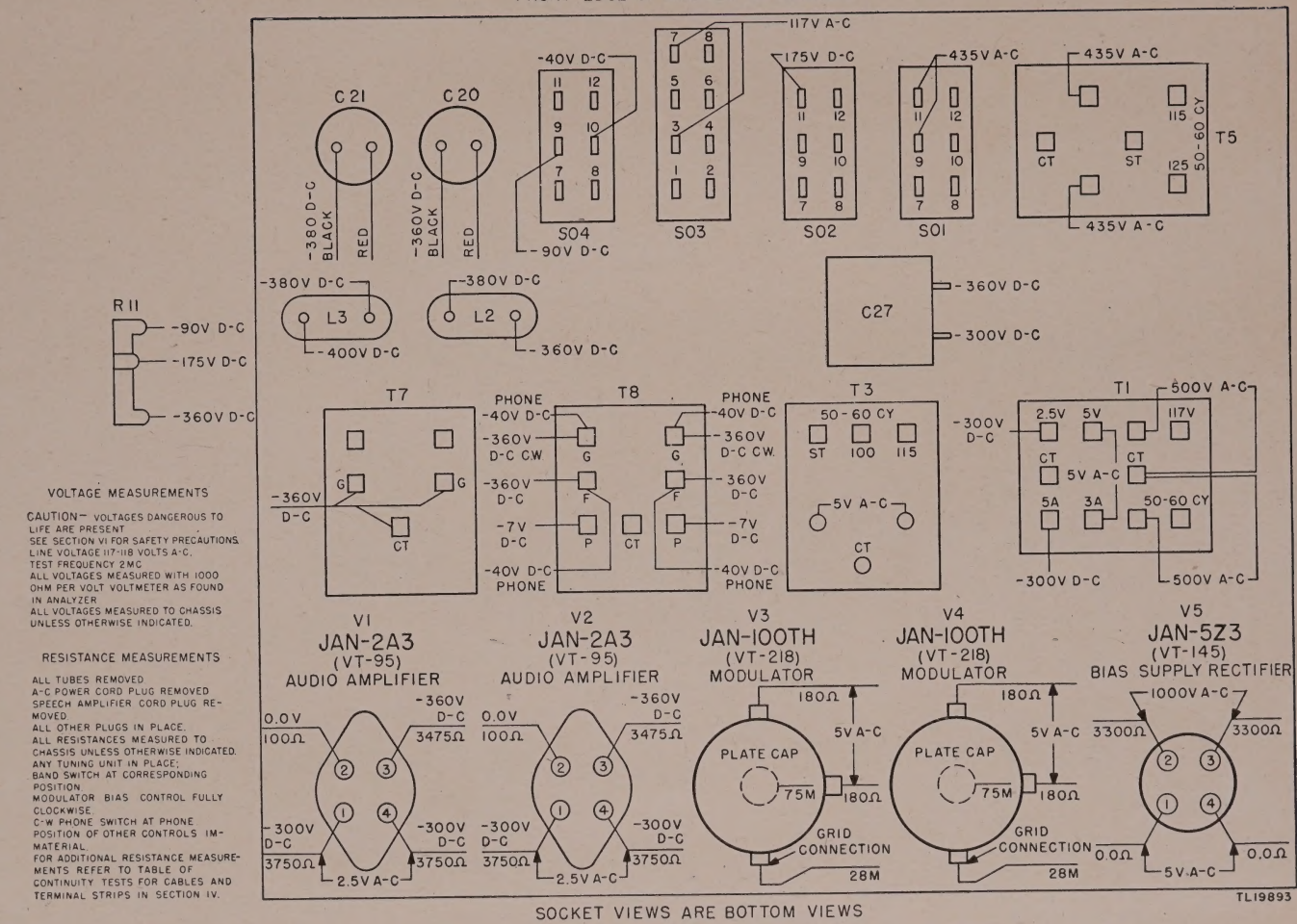


Figure 23. Radio Transmitter BC-610-E, chassis lay-out diagram showing voltages and resistances of r-f section.



VOLTAGE MEASUREMENTS

CAUTION— VOLTAGES DANGEROUS TO LIFE ARE PRESENT.
SEE SECTION VI FOR SAFETY PRECAUTIONS.
LINE VOLTAGE 117-118 VOLTS A-C.
TEST FREQUENCY 2 MC.
ALL VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOLTMETER AS FOUND IN ANALYZER.
ALL VOLTAGES MEASURED TO CHASSIS UNLESS OTHERWISE INDICATED.

RESISTANCE MEASUREMENTS

ALL TUBES REMOVED.
A-C POWER CORD PLUG REMOVED.
SPEECH AMPLIFIER CORD PLUG REMOVED.
ALL OTHER PLUGS IN PLACE.
ALL RESISTANCES MEASURED TO CHASSIS UNLESS OTHERWISE INDICATED.
ANY TUNING UNIT IN PLACE; BAND SWITCH AT CORRESPONDING POSITION.
MODULATOR BIAS CONTROL FULLY CLOCKWISE.
C-W PHONE SWITCH AT PHONE POSITION OF OTHER CONTROLS IMMATERIAL.
FOR ADDITIONAL RESISTANCE MEASUREMENTS REFER TO TABLE OF CONTINUITY TESTS FOR CABLES AND TERMINAL STRIPS IN SECTION IV.

Figure 24. Radio Transmitter BC-610-E, chassis lay-out diagram showing voltages and resistances of modulator section.

1. Transformer T8 for an open secondary winding.
2. Transformer T9 for an open or shorted primary or secondary winding.
3. Resistors R16 and R17 for open circuits.

(b) Replace the defective parts.

(2) *Audio driver stage.* If the modulator section as a whole does not operate, or does not operate satisfactorily, make the following tests. (For other repair features, see par. 31, and fig. 34.)

(a) Turn off the plate power and test with an ohmmeter:

1. Transformer T7 for open primary or secondary windings.
2. Transformer T8 for open primary winding.
3. Resistors R14 and R15 for open circuits.

(b) Replace the defective parts.

(c) Check the grounding connection of transformer T8 primary center tap. If there is an open circuit, resolder it to ground.

(3) *Modulator bias power supply stage.* If the required voltages are not obtained from the modulator bias power supply, make the tests listed below. (For other repair features, see par. 32, and fig. 35.)

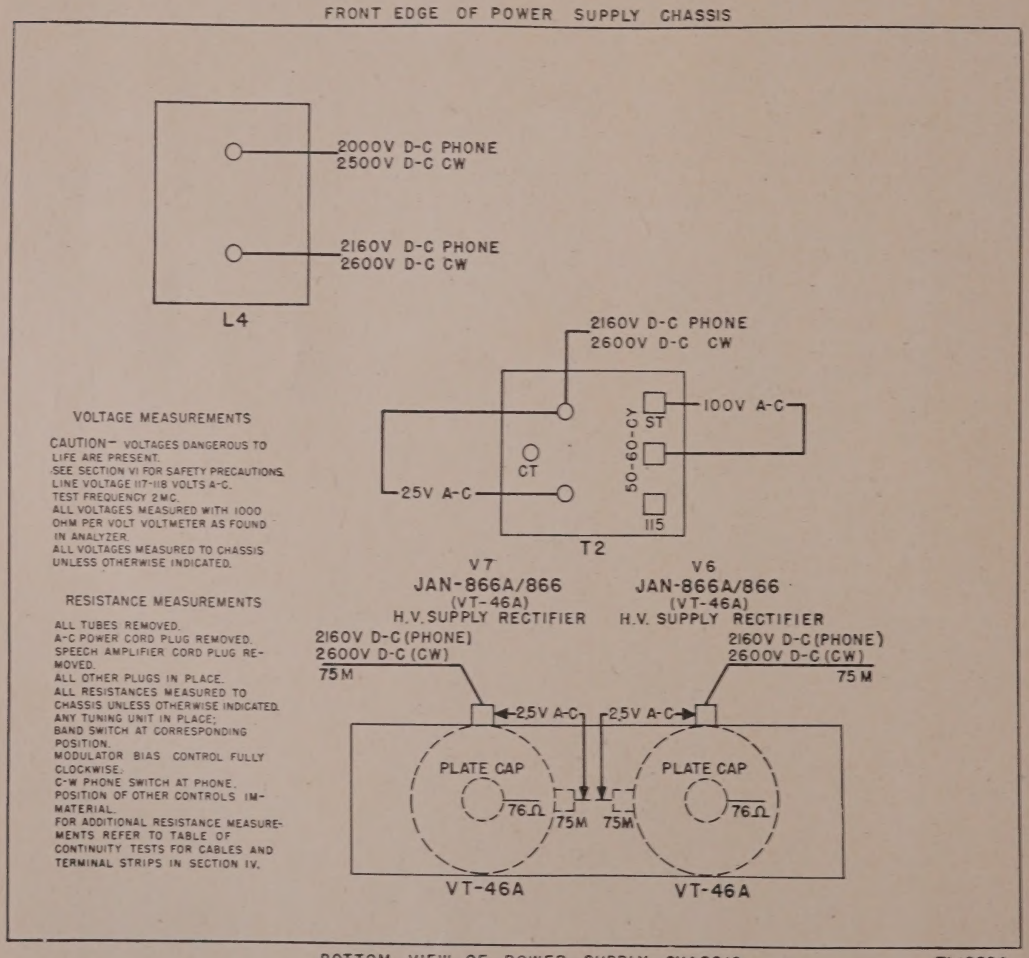


Figure 25. Radio Transmitter BC-610-E, chassis lay-out diagram showing voltages and resistances of power supply.

(a) Turn off all power and test with an ohmmeter:

1. Transformers T1 and T3 for an open or shorted primary or secondary winding.
2. Filter reactors L2 and L3 for an open circuit.
3. Bias resistors R11 and R20 for open circuits.
4. Filter capacitors C20, C21, C22 (C22 is not present in Radio Transmitter BC–610–E) and C27 for a short circuit or leakage.

(b) Replace the defective parts.

(c) See input and output resistance tests. (See par. 16*a*(2) and *b*(2).)

g. Special Tests and Repairs for High-voltage Power Supply Stage. If the required voltage is not obtained from the high-voltage power supply, make the tests listed below. (For other stage repair features see par. 33, and fig. 36.)

(1) Turn off all power and test with an ohmmeter:

(a) Transformers T2 and T6 for an open or shorted primary or secondary winding.

(b) Filter reactor L4 for an open circuit.

(c) Filter capacitors C19 and C23 for short circuits.

(d) Bleeder resistor R13 for an open circuit.

(e) Overload relay RY5 for an open circuit winding.

(2) Replace the defective parts.

(3) Check relays RY2 and RY5 for damaged contacts. (See figs. 56 and 59.) Make the necessary repairs. If required, make overload reset for relay RY2 by pressing switch SW12.

(4) See input and output resistance tests. (See par. 16*a*(1) and *b*(1).)

23. Refinishing, Moistureproofing, and Fungiproofing

a. Refinishing. After the transmitter has been repaired and is operating correctly, remove any scarred or chipped spots with # 0000 sandpaper and apply paint to the spots with a small brush. If the case is sufficiently scarred and chipped to warrant complete refinishing, remove the transmitter chassis from the case. Make certain that the case is free from dirt and rust. Spray the entire case with the proper paint authorized by existing regulations.

b. Moistureproofing and Fungiproofing. This treatment provides a degree of protection against moisture, salt spray, corrosion, fungus growth, and insects. The treatment is applied in the following manner:

(1) *Masking.* Clean transmitter thoroughly, remove shielding of components, and partially disassemble. Cover certain points such as open switches, relays, variable capacitors, sockets, and bearings with masking tape.

(2) *Spraying.* Dry all parts of the equipment thoroughly and spray with three coats of moistureproofing and fungiproofing varnish. Spray all surfaces supporting circuit elements, all circuit elements, and interconnecting wiring and soldered terminals. Use a brush to apply the varnish to all parts which cannot be reached by the spray.

CAUTION: Make certain that a complete job of masking has been done on the parts listed above. If the varnish gets on any of these parts the equipment will not operate satisfactorily.

(3) *General instructions.* For general instructions in the spray method of moistureproofing and fungiproofing see TB SIG 13.

SECTION VII
FINAL TESTING

24. Power Output and Modulation Tests

a. General. After the repairs in the transmitter have been completed and the unit has been moistureproofed and fungiproofed, make a final test to ascertain that the unit is in proper condition for tactical use. Although the transmitter was correctly adjusted during the repair procedure (sec. V), make a recheck of the neutralization, then proceed to final testing of the power output and modulation.

b. Preparation for Testing. To measure the power output and modulation capabilities of the transmitter, connect the test circuits as shown in figure 47. Proceed as follows:

(1) Disconnect the coaxial cable which is between the transmitter and the Antenna Tuning Unit BC–729–(*) or BC–939–A, depending on the transmitter under test.

(2) Connect the dummy antenna to the transmitter r-f output terminals with the r-f test ammeter in series with one lead.

(3) Couple the transmitter output to the vertical deflection plates of the oscilloscope by means of a pick-up coil. This is done by winding 2 to 4 turns of insulated wire (# 14 gauge, soft-drawn copper) over a winding space of 3 inches around one of the r-f leads which connects the dummy antenna to the transmitter output post. Connect the ends of the coil to the oscilloscope by means of a twisted-pair line.

(4) Connect the transmitter to an a-c power source of 5 kilowatts of single-phase, 60-cycle current at 115 volts.

(5) Connect a Speech Amplifier BC–614–( ), one which is known to be in good operating condition, to the transmitter.

c. Power Output Test at C-w Transmission. (1) With the transmitter Key J–37 plugged into Jack J101 on Speech Amplifier BC–614–( ), adjust the transmitter for maxium c-w power output (key down) (tables VII and VIII); test at the middle of the 2.0 to 2.5 mc frequency band in accordance with table X below.

(2) Maximum c-w power output for the frequency under test is obtained when a maximum reading is indicated on the external r-f ammeter. When a 146-ohm dummy antenna is used, the required power outputs are obtained when the r-f output currents are as specified in table X.

(3) The r-f ammeter reading should at least equal the r-f output current specified in table X, for c-w output.

(4) If the c-w r-f current output is as specified in table X, make power output test for unmodulated phone transmission as outlined below. (See (1) through (6) below.)

(5) If the c-w r-f current output reading is not as specified in table X, the performance of the transmitter is unsatisfactory. Proceed as follows:

Table X. Power Output and Modulation Capability
(Dummy antenna—146-ohm (400-watt) resistor, 50-mmf capacitor)

Frequency range in mc	*Tuning Unit	*Coil Unit	Power CW	Output PHONE Unmodulated	R-f output current in amperes		
					CW	PHONE Unmodulated	PHONE (90% modulation)
2.0 to 2.5	TU-47	C-387-B	400	300	1.6	1.4	1.65
2.5 to 3.2	TU-48	C-387-B	400	300	1.6	1.4	1.65
3.2 to 4.0	TU-49	C-387-B	400	300	1.6	1.4	1.65
4.0 to 5.0	TU-50	C-388-A	400	300	1.6	1.4	1.65
5.0 to 6.35	TU-51	C-389-A	400	300	1.6	1.4	1.65
6.35 to 8.0	TU-52	C-390-A	400	300	1.6	1.4	1.65
8.0 to 12.0	TU-53	C-447	300	250	1.4	1.3	1.5
12.0 to 14.0	TU-54	C-448	275	200	1.3	1.1	1.3
14.0 to 18.0	TU-54	C-449	275	200	1.3	1.1	1.3

*Numbers for tuning units and coil units are for Radio Transmitter BC–610–E; use equivalent units on other models.

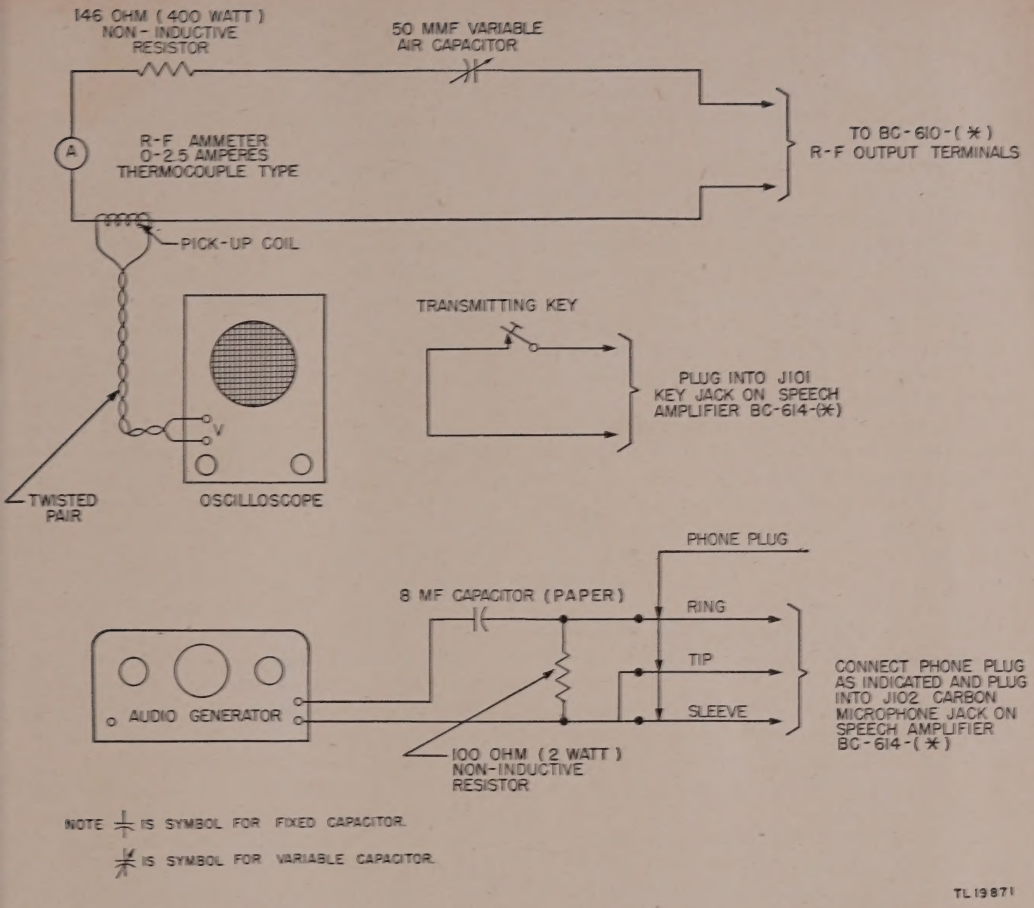


Figure 26. Radio Transmitter BC–610–(*), test circuits for measuring power output and modulation capability, schematic diagram.

(a) Perform tests to localize the defect to the particular stage, and test further to determine the defective part (See par. 22.)

(b) Make necessary repairs and replacements, and repeat c-w power output test as outlined above. (See (1) through (3).)

(c) Repeat the test for c-w power output in this manner until the performance of the transmitter is satisfactory.

d. Power Output Test for Unmodulated Phone Transmission. (1) Remove transmitter Key J–37 from jack J101 on Speech Amplifier BC–614–( ).

(2) Change the transmitter from c-w to phone transmission. (See par. 19*a* and tables VII and VIII.)

(3) Adjust the transmitter for maximum unmodulated phone power output at the same frequency that was used in the c-w power output test.

(4) The maximum reading on the external r-f ammeter will indicate the maximum unmodulated phone power output current for the frequency under test.

(5) The r-f ammeter reading should at least equal the r-f output current specified in table X for unmodulated phone power output.

(6) If the unmodulated phone power output meter reading is as specified in table X, make the

test for modulation capability as outlined in (1) through (19) below.

(7) If the unmodulated phone power output meter reading is *not* as specified in table X, the performance of the transmitter is unsatisfactory. Proceed as follows:

(a) Perform tests to localize the defect to the particular stage, and test further to determine the defective part. (See par. 22.)

(b) Make necessary repairs and replacements, and repeat the unmodulated phone power output test as outlined in (1) through (6) above.

e. Modulation Capability. (1) Keep the transmitter adjusted for maximum unmodulated phone power output at the same frequency that was used in the previous tests.

(2) Insert the audio signal generator plug into Jack J102 on Speech Amplifier BC–614–( ).

(3) Turn on the oscilloscope.

(4) Adjust the sweep voltage on the oscilloscope to make the width of the pattern slightly more than half the diameter of the screen.

(5) The unmodulated r-f carrier wave will be seen on the oscilloscope.

(6) The height of the carrier pattern should be approximately one third of the height of the screen.

(7) Since the height of the carrier pattern depends upon the number of turns in the pick-up coil, it may be increased by increasing the number of turns and decreased by decreasing the number of turns of the coil.

(8) Measure the height of the unmodulated r-f wave (fig. 27, H2) above the reference axis.

(9) Adjust the audio signal generator for a frequency of 400 cycles, and turn it on.

(10) Measure the audio input voltage from the audio signal generator to Speech Amplifier BC–614–( ), using a high resistance a-c voltmeter or an a-c vacuum-tube voltmeter (VTVM).

(11) Adjust the audio signal generator for an initial output of 0.15 volt.

(12) The transmitter output will now be modulated at 400 cycles.

(13) 90 percent modulation is required for satisfactory operation of the transmitter.

(14) At 90 percent modulation, the r-f current in the external test ammeter will increase approximately 18 percent above the unmodulated value which was obtained in the proceeding test; it should at least equal the r-f output current specified in table X for modulated phone power output.

(15) If the value specified in table X is not obtained with 0.15-volt output from the audio signal generator, increase the output of the audio signal generator up to 0.30 volt, and set the speech amplifier control near maximum in order to obtain the specified value.

(16) Observe the modulated wave on the oscilloscope screen to make certain that the sine wave pattern remains undistorted.

(17) The maximum height of the modulated wave (fig. 27, H1) as seen on the oscilloscope should be 1.9 times as great as the height of the unmodulated wave. (See fig. 27, H2.) This indicates a modulation of 90 percent.

(18) If the modulated phone power output reading equals that specified in table X, and if, with an audio signal generator output of 0.30 volt, the wave height H1 is 1.9 times as high as wave height H2 without distortion, then the performance of the transmitter is satisfactory.

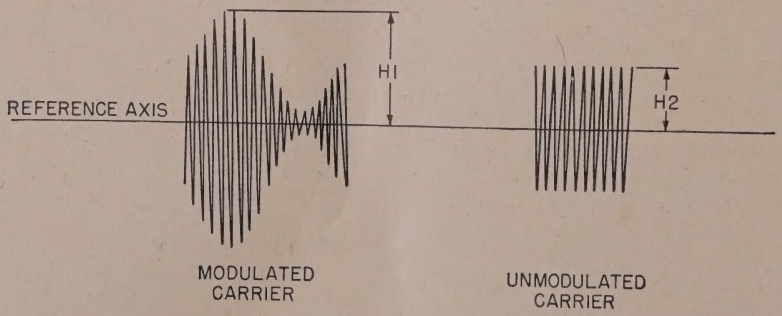


Figure 27. Radio Transmitter BC–610–(*), oscilloscope pattern for modulation test.

(19) If it has been impossible to meet the foregoing requirements of this test, the performance of the transmitter is unsatisfactory. Proceed as follows:

(a) Perform tests to localize the defect to the particular stage, and test further to determine the defective part. (See par. 22.)

(b) Make the necessary repairs and replacements, and repeat the test for modulation capability as outlined in *e*(1) through (16) above.

f. Tests for all Bands. The foregoing tests present a procedure for testing the c-w power output, the unmodulated phone power output, and the modulation capability in the frequency band 2.0 to 2.5 mc. Perform these three tests as outlined above on all of the other bands specified in table X, testing each band in the order listed.

25. R-F Oscillator Stage *(fig. 28)*

a. Circuit Repair Features. The r-f oscillator stage consists of Tube JAN–6V6GT (V8) (VT–107 or VT–107–A) operating in a Hartley oscillator circuit. Frequency is determined either by master-oscillator or crystal control in the grid circuit, depending on the setting of the M. O.-XTAL switch, SW15. When switch SW15 is set for master-oscillator control, the frequency can be varied over a range dependent on the particular tuning unit used. When switch SW15 is in position for crystal control, a fixed frequency is generated whose value depends on the particular crystal plugged into the jack provided for this purpose. Oscillations generated by the oscillator circuit are tapped from the plate of tube V8, and are fed to the grid circuit of buffer-doubler Tube JAN–6L6 (V9) (VT–115) through capacitor C13. The voltage is regulated by a system comprising Tubes JAN–3/VR–150 (V13, V14, and V15) (VT–139). Tube V13 maintains constant screen voltage, and tubes V14 and V15 maintain constant plate voltage on oscillator tube V8.

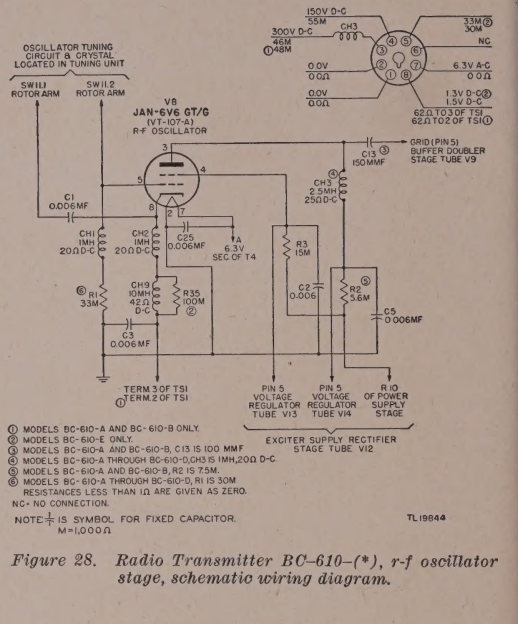


Figure 28. Radio Transmitter BC–610–(*), r-f oscillator stage, schematic wiring diagram.

b. Parts Data for Oscillator Stage.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C1	ABCD	3DA6–36	CAPACITOR, fixed: mica; 0.006-mf, ±5%; 300 vdcw.	Tube V8 cathode coupling.
C1	E	3K4160224	CAPACITOR, fixed: paper; 0.006-mf, ±20%; 600 vdcw; type 340–24.	Tube V8 cathode coupling.
C2	ABCD	3DA6–10	CAPACITOR, fixed: mica; 0.006-mf, ±10%; 300 vdcw.	Tube V8 screen bypass.
C2	E	3K4160224	CAPACITOR, fixed: paper; 0.006-mf, ±20%; 600 vdcw; type 340–24.	Tube V8 screen bypass.
C3	ABCD	3DA6–10	CAPACITOR, fixed: mica; 0.006-mf, ±10%; 300 vdcw.	Tube V8 cathode return bypass.
C3	E	3K4160224	CAPACITOR, fixed: paper; 0.006-mf, ±20%; 600 vdcw; type 340–24.	Tube V8 cathode return bypass.
C5	ABCD	3DA6–10	CAPACITOR, fixed: paper; 0.006-mf, ±10%; 300 vdcw.	Tube V8 plate return bypass.
C5	E	3K4160224	CAPACITOR, fixed: paper; 0.006-mf, ±20%; 600 vdcw; type 340–24.	Tube V8 plate return bypass.
C13	AB	3K2015114	CAPACITOR, fixed: mica; 100-mmf, ±20%; 500 vdcw.	Coupling between tubes V8 and V9.
C13	CDE	3K2010114	CAPACITOR, fixed: mica; 150-mmf, ±20%; 500 vdcw.	Coupling between tubes V8 and V9.
C25	ABCD	3DA6–10	CAPACITOR, fixed: mica; 0.006-mf, ±10%; 300 vdcw.	Tube V8 filament bypass.
C25	E	3K4160224	CAPACITOR, fixed: paper; 0.006-mf, ±20%; 600 vdcw; type 340-24.	Tube V8 filament bypass.
CH1	ABCDE	3C363	COIL, r-f: 1-mh, ±10%; 20-ohm d-c, ±20%.	Tube V8 grid return r-f choke.
CH2	ABCDE	3C363	COIL, r-f: 1-mh, ±10%; 20-ohm d-c, ±20%.	Tube V8 cathode return r-f choke.
CH3	ABCD	3C363	COIL, r-f: 1-mh, ±10%; 20-ohm d-c.	Tube V8 plate return r-f choke.
CH3	E	3C550–1	COIL, r-f: 2.5-mh, ±5%; 500-ma; 25-ohm d-c.	Tube V8 plate return r-f choke.
CH9	ABCDE	3C550	COIL, r-f: 10-mh, ±10%; 500-ma; 42-ohm d-c.	Tube V8 cathode return r-f choke.
R1	ABCD	3Z4540	RESISTOR, fixed: 30,000-ohm, ±10%; ½-watt; type BT-½.	Tube V8 grid bias.

b. Parts Data for Oscillator Stage. (Contd.).

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
R1	E	3RC21AE333K	RESISTOR, fixed: composition; 33,000-ohm, ±10%; ½-watt.	Tube V8 grid bias.
R2	AB	3Z6575–20	RESISTOR, fixed: 7,500-ohm, ±5%; 20-watt; type 20 VWQ.	Tube V8 plate voltage stabilizing.
R2	CDE	3Z6506–8	RESISTOR, fixed: wire-wound; 5,600-ohm, ±5%; 20-watt; type 20 VWQ.	Tube V8 plate voltage stabilizing.
R3	ABCDE	3Z6615–131	RESISTOR, fixed: wire-wound; 15,000-ohm, ±5%; 20-watt; type 20 VWQ.	Tube V8 screen dropping.
R35	E	3RC21AE104K	RESISTOR, fixed: composition; 100,000-ohm, ±10%; ½-watt.	Tube V8 cathode parasitic suppressor.
V8	ABCD	2T107	TUBE JAN–6V6 (VT–107): pentode.	R-f oscillator.
V8	E	2T107–A	TUBE JAN–6V6GT (VT–107–A): pentode; Alternate glass envelope.	R-f oscillator.

26. R-F Buffer-Doubler Stage *(fig. 29)*

a. Circuit Repair Features. The r-f buffer-doubler stage consists of Tube JAN–6L6 (V9) (VT–115), and its associated circuit elements. Grid voltage for this tube is obtained from resistors R23 and R24. Screen voltage is obtained through resistor R25, and is bypassed at radio frequencies by capacitor C4. The plate circuit of tube V9 is resonated by a parallel coil and condenser tuned circuit contained in the tuning units. Under master-oscillator control, the plate circuit of tube V9 is always tuned to twice the frequency of the master-oscillator circuit to prevent reaction from the succeeding stages. Under crystal control, tube V9 operates as a buffer amplifier or as a frequency doubler depending upon the frequency range covered. (See table II.) R-f voltage from the tuned circuit of tube V9 is isolated from the power circuit by r-f choke CH5 and bypass capacitor C26. R-f voltage from the plate of tube V9 is fed to the grids of intermediate-amplifier Tubes JAN–807 (V10 and V11) (VT–100 or VT–100–A) through parasitic resistors R21 and R22 and blocking capacitor C14.

b. Parts Data for Buffer-doubler Stage.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C4	ABCD	3DA6–23	CAPACITOR, fixed: mica; 0.006-mf, ±20%; 300 vdcw; type 1 w.	Tube V9 screen bypass.
C4	E	3K4160224	CAPACITOR, fixed: paper; 0.0006-mf, ±20%; 600 vdcw; type 340–24.	Tube V9 screen bypass.
C8	ABCD	3DA6–23	CAPACITOR, fixed: mica; 0.006-mf, ±5%; 500 vdcw; special.	Tube V9 cathode bypass.
C8*	E	3K2030112	CAPACITOR, fixed: mica; 300-mmf, ±5%; 500 vdcw; special.	Tube V9 cathode bypass.
C14	ABCDE	3K4520112	CAPACITOR, fixed: mica; 200-mmf, ±5%; 2,500 vdcw; type E.	Coupling between tube V9 and tubes V10 and VII.
C26	ABCD	3DA6–10	CAPACITOR, fixed: mica; 0.006-mf, ±20%; 500 vdcw; type 1460.	Tube V9 plate bypass.
C26	E	3K4160224	CAPACITOR, fixed: paper; 0.006-mf, ±20%; 600 vdcw; type 340–24.	Tube V9 plate bypass.
CH4	ABCD	3C363	COIL, r-f: 1-mh, ±10%; 20-ohm d-c resistance; type 4885.	Tube V9 grid return r-f choke.
CH4**	CD	3C308–3	COIL, r-f: 2.5-mh, ±10%; 8.5-ohm resistance; type 4979.	Tube V9 grid return r-f choke.
CH5	ABCDE	3C363	COIL, r-f: 1-mh, ±10%; 20-ohm d-c resistance; type 4885.	Tube V9 plate return r-f choke.
R5	ABCD	3Z6610–213	RESISTOR, fixed: 10,000-ohm, ±5%; 20-watt; type 20VWQ.	Tube V9 plate-voltage dropping.
R23	ABCD	3RC41AE303J	RESISTOR, fixed: composition; 30,000-ohm, ±5%; 2-watt.	Tube V9 grid bias.
R23	E	3RC31AE334K	RESISTOR, fixed: composition; 33,000-ohm, ±10%; 1-watt.	Tube V9 grid bias.
R24	ABCDE	3Z6050–108	RESISTOR, fixed: wire-wound; 500-ohm, ±10%; 10-watt.	Tube V9 cathode bias.
R25***	ABCDE	3RC41AE473K	RESISTOR, fixed: composition; 47,000-ohm, ±10%; 2-watt.	Tube V9 screen dropping.
R28	ABCD	3Z6620–52	RESISTOR, fixed: wire-wound; 20,000-ohm, ±5%; 20-watt; type 20VWQ.	Tube V9 plate dropping.
V9	ABCD	2T115A	TUBE JAN–6LGT(VT–115–A): pentode; glass.	Buffer-doubler.
V9	E	2T115	TUBE JAN–6L6 (VT–115): pentode.	Buffer-doubler.

*Value on drawings is 250 mmf, the value used in the engineer's design.
**Value on drawings is 25 ohms d-c resistance, the value used in the engineer's design.
***Value on drawings is 50,000 ohms, the value used in the engineer's design.

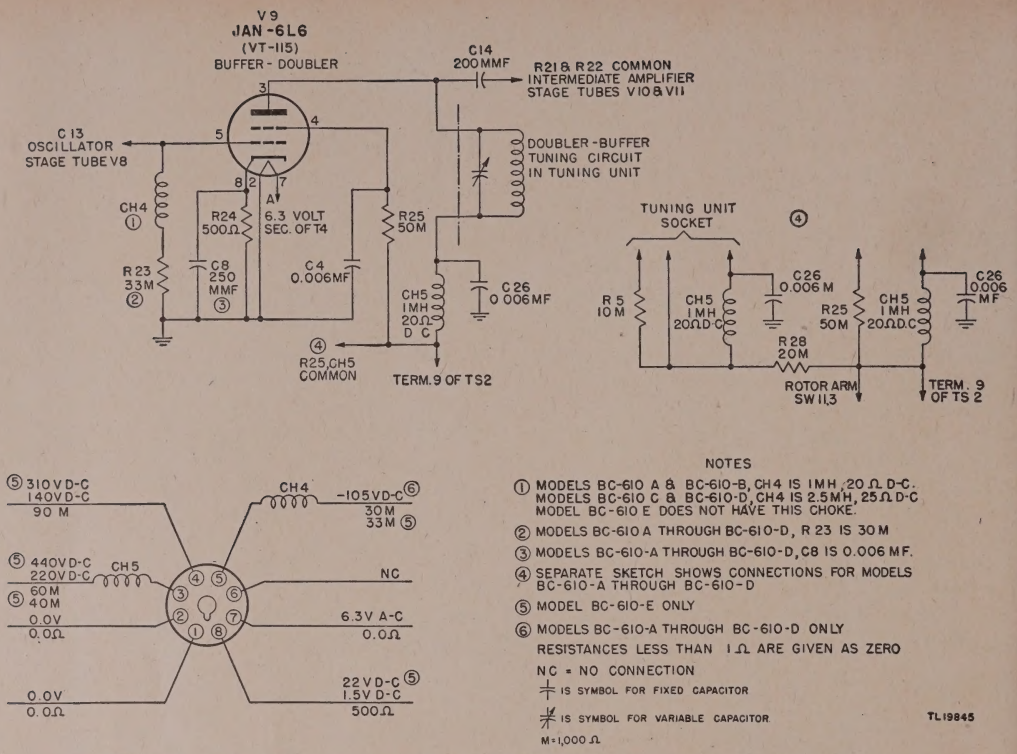


Figure 29. Radio Transmitter BC–610–(*), r-f buffer-doubler stage, schematic wiring diagram.

27. R-F Intermediate-Amplifier Stage *(fig. 30)*

a. Circuit Repair Features. The r-f intermediate-amplifier stage consists of Tubes JAN–807 (V10 and V11) (VT–100 or VT–100–A) connected in parallel to a tuned tank circuit located in the tuning unit. Tubes V10 and V11 are biased to cut-off by r-f choke CH7 when no excitation is present, as during periods when the key is up. Screen grid voltage is supplied through resistors R6 and R7, which are bypassed by capacitors C6 and C7. Plate voltage is supplied through r-f choke CH6 and is bypassed by capacitor C24. The output of the r-f intermediate-amplifier stage is fed to the grid of power-amplifier Tube JAN–250TH (V16) (VT–220), through capacitor C15.

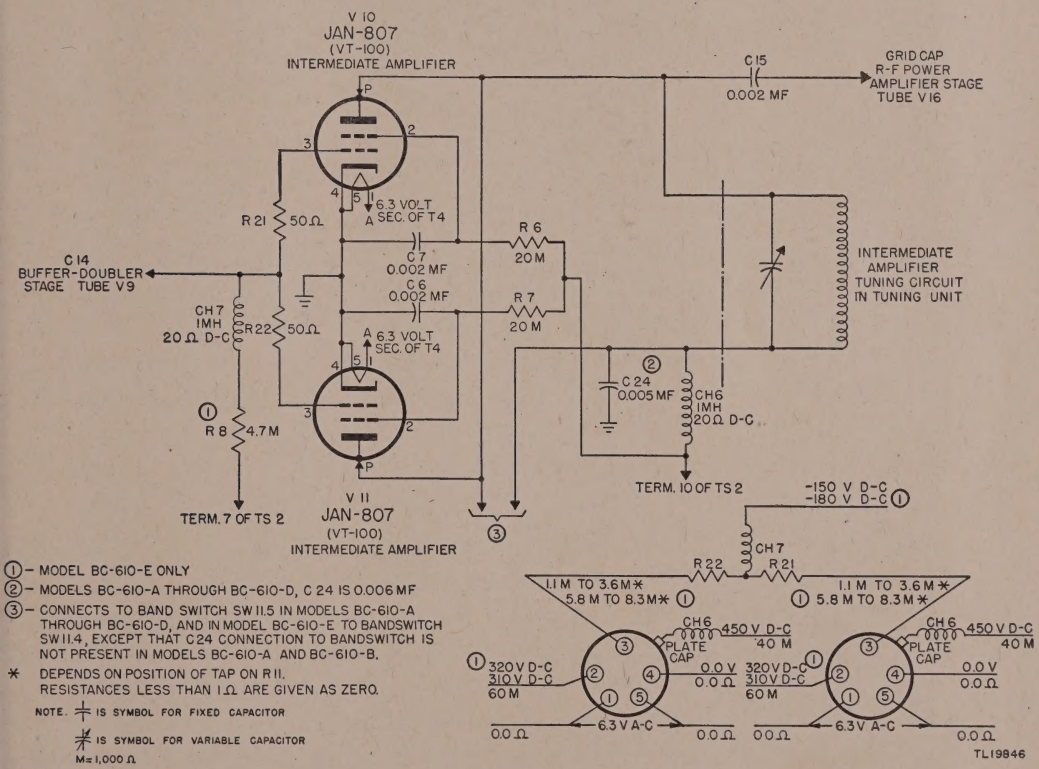
b. Parts Data for Intermediate-Amplifier Stage.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C6	ABCDE	3K4120224	CAPACITOR, fixed: paper; 0.002-mf, ±10%; 600 vdcw.	Tube V11 screen bypass.
C7	ABCDE	3K4120224	CAPACITOR, fixed: paper; 0.002-mf, ±10%; 600 vdcw.	Tube V10 screen bypass.
C15	ABCD	3K5020212	CAPACITOR, fixed: mica; 0.002-mf, ±50%; 2,500 vdcw.	Coupling between tubes V10, V11, and tube V16.
C15	E	3DA2–86	CAPACITOR, fixed: mica; 0.002-mf, ±10%; 600 vdcw.	Coupling between tubes V10, V11 and tube V16.
C24*	ABCD	3K4562212	CAPACITOR, fixed: mica; 0.0062-mf, ±5%; 600 vdcw.	Tube V10 and V11 plate return bypass.
C24	E	3DA5–108	CAPACITOR, fixed: oil-filled; 0.005-mf, ±20%; 1,000 vdcw; Inco special.	Tube V10 and V11 plate return bypass.

b. Parts Data for Intermediate-amplifier Stage (Contd.).

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
CH6	ABCDE	3C363	COIL, r-f; 1-mh, ±10%; 20-ohms, d-c ±20%; type 4885.	Tube V10 and V11 plate return r-f choke.
CH7	ABCDE	3C363	COIL, r-f; 1-mh, ±10%; 20-ohms, d-c ±20%; type 4885.	Tube V10 and V11 grid return r-f choke.
R6**	ABCDE	3RC41AE223K	RESISTOR, fixed; composition; 22,000-ohm, ±10%; 2-watt; carbon.	Tube V10 and V11 screen voltage dropping.
R7**	ABCDE	3RC41AE223K	RESISTOR, fixed; composition; 22,000-ohm, ±10%; 2-watt.	Tube V11 screen voltage dropping.
R8	E	3RC41AE472K	RESISTOR, fixed; 4,700-ohm, ±10%; 2-watt.	Tube V10 and V11 grid bias.
R21	ABCDE	3RC21AE510J	RESISTOR, fixed; composition; 50-ohm, ±5%; ½-watt.	Tube V10 grid parasitic suppressor.
R22	ABCDE	3RC21AE510J	RESISTOR, fixed; composition; 50-ohm, ±5%; ½-watt.	Tube V11 grid parasitic suppressor.
V10, V11	ABCDE	2T100	TUBE JAN-807 (VT-100) (VT-100-A): pentode	Intermediate amplifier.

*Value on drawings is 0.006 mf, the value used in the engineer's design.
**Value on drawings is 20,000 ohms, the value used in the engineer's design.



① – MODEL BC-610-E ONLY
② – MODELS BC-610-A THROUGH BC-610-D, C 24 IS 0.006 MF
③ – CONNECTS TO BAND SWITCH SW 11.5 IN MODELS BC-610-A THROUGH BC-610-D, AND IN MODEL BC-610-E TO BANDSWITCH SW 11.4, EXCEPT THAT C 24 CONNECTION TO BANDSWITCH IS NOT PRESENT IN MODELS BC-610-A AND BC-610-B.
* DEPENDS ON POSITION OF TAP ON R 11. RESISTANCES LESS THAN 1 Ω ARE GIVEN AS ZERO.
NOTE. ⫩ IS SYMBOL FOR FIXED CAPACITOR
⫩ IS SYMBOL FOR VARIABLE CAPACITOR M = 1,000 Ω

Figure 30. Radio Transmitter BC-610-(*), r-f intermediate-amplifier stage, schematic wiring diagram.

28. R-F Power Amplifier Stage *(fig. 31)*

a. Circuit Repair Features. The power amplifier (p-a) stage consists of Tube JAN-250TH (V16) (VT-220), operating in a neutralized class C p-a circuit. Grid bias voltage is provided through choke CH8 by the main bias-voltage power supply. With the key up, the tube is biased to cut-off the plate current of the tube. With the key down, the r-f voltage supplied by the intermediate amplifier stage causes the grid to draw a current of 60 to 100 ma. The tuned plate circuit is center tapped so that an equal out-of-phase

voltage is present for feeding back to the grid through blocking capacitor C29 and neutralizing capacitor C18. Neutralizing capacitor C18 cancels the effect of the grid-plate capacitance so that tube V16 will operate without spurious oscillations. The r-f output power is taken from the tank circuit by a coupling coil which is wound around the outside of the output coil unit. When the associated radio receivers are used, the coupling coil is short-circuited by contacts on relay RY4, thereby eliminating absorption at the transmitter frequency. Output power is fed to Antenna Tuning Unit BC–729–(*) in Radio Transmitters BC–610–A through BC–610–D and to BC–939–A in BC–610–E.

CAUTION: When taking high voltage measurements on this stage, follow the precautions outlined in paragraph 22*d* (1) *(d)*.

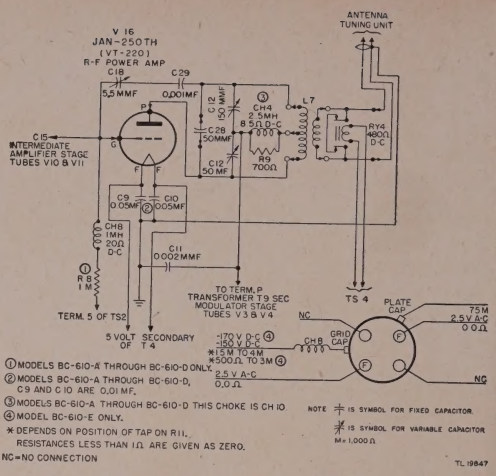


Figure 31. Radio Transmitter BC–610–(*), r-f power amplifier stage, schematic wiring diagram.

b. Parts Data for Power Amplifier.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C9, 10	ABCD	3K4562212	CAPACITOR, fixed: mica; 0.01-mf, ±20%; 600 vdcw; dual.	Tube V16 filament bypass.
C9, 10	E	3DA50–180	CAPACITOR, fixed: paper; oil-filled; 0.05-mf, ±20%; 600 vdcw; dual; type BMM 306–140.	Tube V16 filament bypass.
C11	ABCDE	3K7020222	CAPACITOR, fixed: mica; 0.002-mf, ±5%; 5,000 vdcw.	Tube V16 plate return bypass.
C12	ABCDE	3D9150V–4	CAPACITOR, variable: air; 150-mmf max; 7,000 vdcw.	Final amplr plate tuning.
C18	ABCDE	3D9005VE5	CAPACITOR, variable: air; 5.5-mmf max; 3,000 vdcw.	Final amplr neutralizing.
C28	ABCDE	3D423	CAPACITOR CA–423: fixed; vacuum; 50-mmf; 32,000 v ac.	Final amplr padding.
C29*	ABCDE	3K7020122	CAPACITOR, fixed: mica; 0.0002-mf, ±10%; 5,000 vdcw.	Neutralizing high-voltage isolation.
CH4	E	3C308–3	COIL, r-f: 2.5-mh, ±10%; 8.5-ohm d-c.	Tube V16 plate return r-f choke.
CH8	ABCD	3C363	COIL, r-f: 1-mh; ±10%; 20-ohm d-c, ±20%.	Tube V16 grid return r-f choke.
CH10	ABCD	3C308–3	COIL, r-f: 2.5-mh, ±10%; 8.5-ohm d-c; 500-ma.	Tube V16 plate return r-f choke.
L7	ABCDE	3C280–387D	COIL, C–387–D: r-f; pri, 32-turn; sec, 6½-turn.	2.0-to 3.5-mc final amplr tank coil.
L7	ABCDE	3C280–388C	COIL, C–388–C: r-f; pri, 24-turn; sec, 4½-turn.	3.5- to 4.5-mc final amplr tank coil.
L7	ABCDE	3C280–389C	COIL, C–389–C: r-f; pri, 14-turn; sec, 4½-turn.	4.5- to 5.7-mc final amplr tank coil.
L7	ABCDE	3C300–390C	COIL, C–390–C: r-f; pri, 14-turn; sec, 4½ turn.	5.7- to 8.0-mc final amplr tank coil.
L7	E**	3C300–447B	COIL, C–447–B: r-f; pri, 10-turn; sec, 4½-turn.	8.0- to 11.0-mc final amplr tank coil.
L7	E**	3C300–448B	COIL C–448–B: r-f; pri, 8-turn; sec, 2½-turn.	11.0- to 14.0-mc final amplr tank coil.
L7	E**	3C300–449B	COIL C–449–B: r-f; pri, 6-turn; sec, 1½-turn.	14.0- to 18.0-mc final amplr tank coil.
R8	ABCD	3Z6100–6	RESISTOR, fixed: wire-wound; 1,000-ohm, ±5%; 10-watt.	Tube V16 grid bias.
R9	ABCDE	3Z6070–24	RESISTOR, fixed: wire-wound; 700-ohm, ±5%; 20-watt.	Tube V16 plate choke shunt.
RY4	ABCDE	2Z7717.3	RELAY: DPDT; 117-v ac; type 1702 MX.	Ant. short-out.
V16	ABCDE	2T220	TUBE JAN–250TH (VT–220): triode.	Final r-f amplifier.

*Value on drawings is 0.001 mf, the value used in the engineer's design.
**These coils are used with Radio Transmitters BC–610–A through BC–610–D when the frequency is increased to 18 mc with the use of Frequency Conversion Kit MC–517. For details, see C1, TM 11–280.

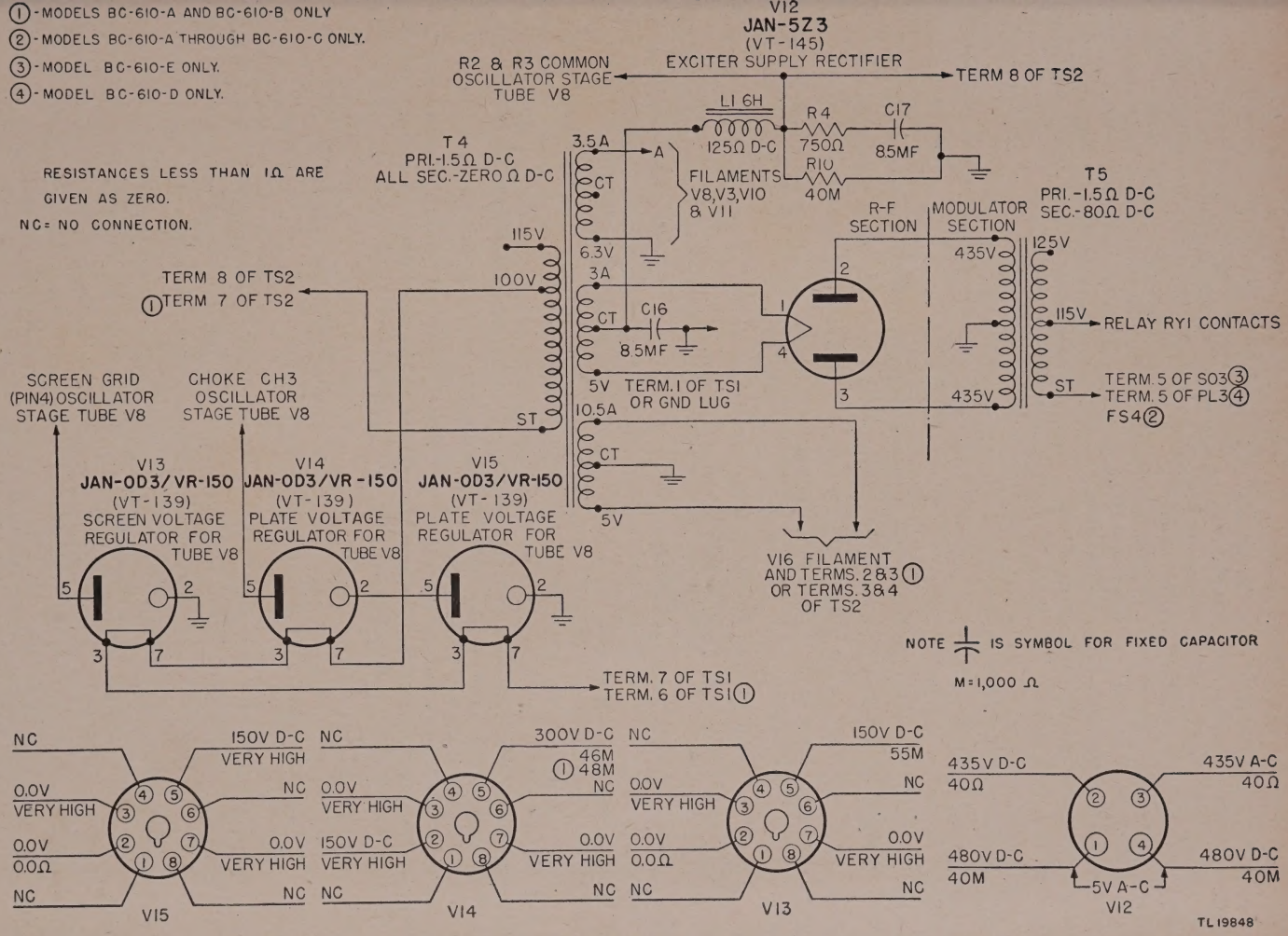


Figure 32. Radio Transmitter BC–610–(*), r-f power supply stage, schematic wiring diagram.

29. R-F Power Supply Stage *(fig. 32)*

a. Circuit Repair Features. Filament voltage for the r-f section is supplied by transformer T4. One winding supplies the filament voltage to oscillator tube V8, buffer-doubler tube V9, and intermediate amplifier tubes V10 and V11 with 6.3 volts of alternating current. Another winding with grounded center tap supplies the filament voltage to final amplifier tube V16. A third winding supplies 5 volts to tube V12 which is the rectifier for the r-f section. Tube V12 rectifies the power from transformer T5 on the center chassis. The rectified power is filtered by capacitors C16 and C17, and by filter choke L1. Resistor R4 prevents keying surges, and thereby prevents a shift in the signal. Resistor R10 acts as a bleeder resistor to drain off any charge remaining when the plate power is removed. The r-f power supply includes voltage regulator tubes V13, V14, and V15 which provide screen and plate voltage control for oscillator tube V8.

b. Parts Data for R-F Power Supply.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C16, 17	ABCDE	3DB8–33	CAPACITOR, fixed: 8-mf, −10% +20%; 1,000 vdcw; dual; oil filled.	Exciter power supply input filter.
L1	ABCDE	3C560	REACTOR: 6-h; 250-ma; 125-ohm d-c; Standard Transformer 10C13.	Exciter power supply filter.
R4	ABCDE	3Z4607	RESISTOR RS–207: 750-ohm, ±10%; 1-watt; RC31BE751J.	Filter network.
R10	ABCDE	3Z6640–16	RESISTOR: 40,000-ohm, ±5%; 20-watt.	Exciter power supply bleeder.
T4	ABCDE	2Z9614.2	TRANSFORMER: pri 100-115-v; sec, (1) 5-v ct at 10.5 amp, (2) 6.3-v ct at 3.5 amp, (3) 5-v ct at 3 amp.	Filament supply for tubes V8, V9, V10, V11, V12 and V16.
T5	ABCDE	2Z9612	TRANSFORMER: pri 125-115-v ac; sec 870-v ct at 250 ma.	Plate transformer of exciter power supply.
V12	ABCDE	2T145	TUBE JAN–5Z3 (VT–145): duo-diode.	Exciter supply rectifier.
V13, V14	ABCDE	2T139	TUBE JAN–OD3/VR–150 (VT–139): diode; gas filled.	Tube V8 screen voltage regulator.
V15	ABCDE	2T139	TUBE: Same as V13.	Tube V8 plate voltage regulator.

30. Modulator Stage *(fig. 33)*

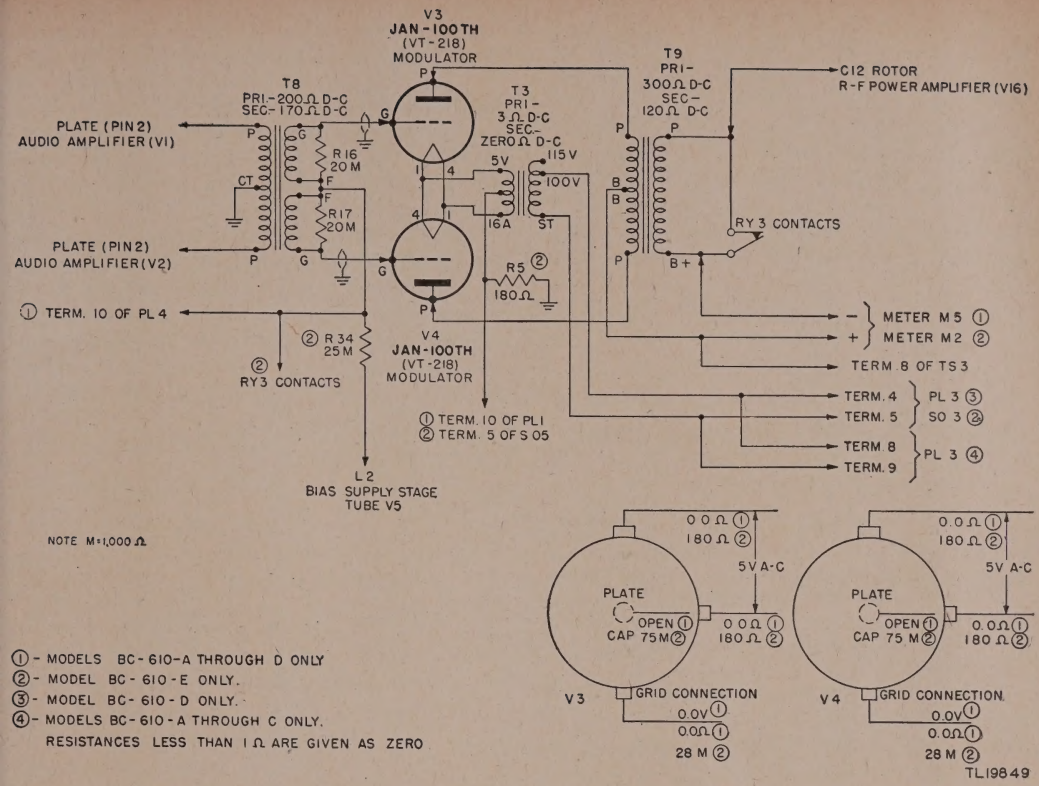
a. Circuit Repair Features. The modulator stage consists of tubes V3 and V4 operating in a push-pull class B amplifier circuit, the tubes being biased near cut-off. Grid bias and plate current are controlled by potentiometer R12. The plates of tubes V3 and V4 are connected to the primary winding of modulation transformer T9 whose secondary is, during phone operation, connected in series with the high-voltage plate power supply of r-f p-a tube V16. The audio power output voltage of the modulator section plate-modulates the r-f p-a stage during phone operation, thereby superimposing the a-f voice wave on the r-f carrier wave. In this way the r-f carrier is amplitude-modulated.

CAUTION: When taking high voltage measurements on this stage follow precautions outlined in paragraph 22*d*(1)*(d)*.

b. Parts Data for Modulator Stage.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
R5	E	3Z6018–12	RESISTOR, fixed: wire-wound; 180-ohm, ±10%; 20-watt.	Protective bias resistor for tubes V3 and V4.
R16, R17*	ABCDE	3RC41AE223K	RESISTOR, fixed: composition; 22,000-ohm, ±10%; 2-watt.	Transformer T8 secondary loading.
R34	E	3Z6625–35	RESISTOR, fixed: wire-wound; 25,000-ohm, ±10%; 10-watt.	Tubes V3 and V4 grid return.
T3	ABCDE	2Z9614.1	TRANSFORMER: pri, 115-100-v ac; sec, 5-v ct at 16 amp; type 10P35.	Filament supply for tubes V3 and V4.
T8	ABCDE	2Z9633.24	TRANSFORMER: pri, 5,000-ohm; ratio 1:1.35; ½ pri to ½ sec.	Driver tubes V1 and V2 plates to mod tubes V3 and V4 grids.
T9	ABCDE	2Z9634.3	TRANSFORMER: pri, 16,000-ohm ct; sec, 8,330-ohm ct at 2 50 ma.	Mod tubes V3 and V4 plates to final amplr h-v circuit.
V3, V4	ABCDE	2T218	TUBE JAN–100TH (VT–218): triode.	Class "B" modulator.

*Value on drawings is 20,000 ohms, the value used in the engineer's design.



① - MODELS BC-610-A THROUGH D ONLY
② - MODEL BC-610-E ONLY.
③ - MODEL BC-610-D ONLY.
④ - MODELS BC-610-A THROUGH C ONLY.
RESISTANCES LESS THAN 1 Ω ARE GIVEN AS ZERO

Fig. 33. Radio Transmitter BC–610–(*) modulator stage, schematic wiring diagram.

31. Audio Driver Stage *(fig. 34)*

a. Circuit Repair Features. A-f speech currents from Speech Amplifier BC–614–( ) enter the modulator section through transformer T7, the secondary of which connects to the grids of audio driver tubes V1 and V2. These tubes operate as push-pull class A audio power amplifiers. The plate circuits of tubes V1 and V2 deliver their power to the primary of driver transformer T8, whose secondary connects to the grids of modulator tubes V3 and V4.

b. Parts Data for Audio Driver.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
R14, R15	ABCDE	3Z4550	RESISTOR: 100,000-ohm, +10%; ½-watt.	Transformer T7 secondary loading.
T7	ABCDE	2Z9636	TRANSFORMER: pri, 500-ohm; sec 20,000-ohm ct; type 10A21.	Interstage, BC–614–( ) to grids of tubes V1 and V2.
T8	ABCDE	2Z9632.2	TRANSFORMER: pri, 5,000-ohm; ratio 1:1.35; ½ pri to ½ sec.	Driver tubes V1 and V2 plates to mod tubes V3 and V4 grids.
V1, V2	ABCDE	2T95	TUBE JAN-2A3 (VT-95): triode.	Audio amplifier.

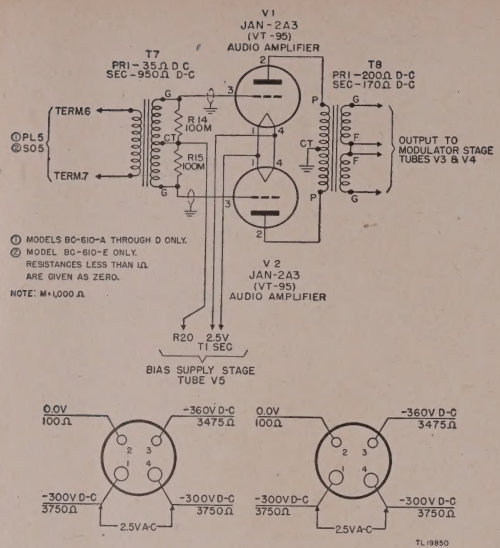


Figure 34. Radio Transmitter BC–610–(*), audio driver stage, schematic wiring diagram.

32. Modulator Bias Power Supply *(fig. 35)*

a. Circuit Repair Features. Transformer T3 supplies filament power for modulator tubes V3 and V4. Transformer T1 supplies filament power for audio driver tubes V1 and V2, and filament and plate power to rectifier tube V5. Tube V5 supplies plate power through a filter consisting of chokes L2 and L3 and capacitors C20 and C21 to the two audio driver tubes V1 and V2. This power supply is operated with the positive terminal at ground potential. Thus, the negative potential will be below ground potential. This negative potential supplies plate power for tubes V1 and V2, and serves as a source of negative bias voltage for modulator tubes V3 and V4, class C p-a tube V16, and intermediate-amplifier tubes V10 and V11. In order to obtain a bias voltage supply with good regulation, a bleeder consisting of resistor R11 and potentiometer R12 is connected across the output of the filter. These resistors may be adjusted to obtain voltages of the proper value. Capacitor C22 is connected in the bias supply to hold constant the bias voltage supplied to p-a tube V16. Capacitor C22 is omitted on Radio Transmitter BC–610–E. (See table II.)

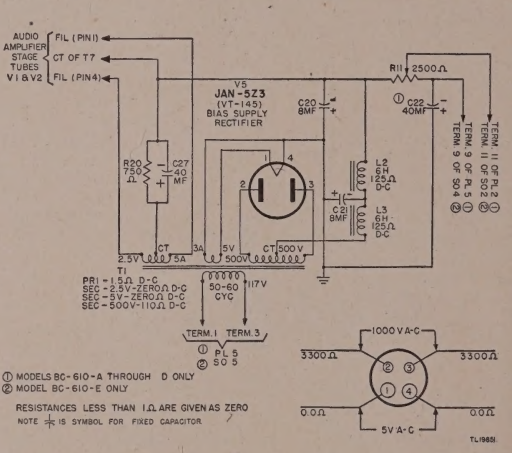


Figure 35. Radio Transmitter BC–610–(*), modulator bias power supply stage, schematic wiring diagram.

b. Parts Data for Modulator Bias Power Supply Stage.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C20, 21	ABCDE	3DB8–34	CAPACITOR, fixed: 8-mf, −10% +40%; elect; 600 vdcw.	Bias power supply filter.
C22	ABCD	3DB40–7	CAPACITOR, fixed: 40-mf, −10%, +50%; elect; 450 vdcw; type 010458B.	Mod bias filter.
C27	ABCDE	3DB40–5	CAPACITOR, fixed: 40-mf, −10% +40%; elect; 100 vdcw.	Tubes V1 and V2 cathode bypass.
L2, 3	ABCDE	3C560	REACTOR: 6-h; 250-ma; 125-ohm d-c; Standard Transformer 10C13.	Bias power supply filter.
R11	ABCDE	3Z6250–27	RESISTOR: adjustable tap; 2,500-ohm, +50%; 100-watt.	Bias supply bleeder.
R20	ABCDE	3Z6075–16	RESISTOR: 750-ohm, +5%; 10-watt; type BD.	Tubes VI and V2 cathode bias.
T1	ABCDE	2Z9613.3	TRANSFORMER: pri, 117-v ac; sec, (1) 1,000-v ct at 220 ma, (2) 2.5-v ct at 5 amp, (5) 5-v ct at 10 amp, type 10P33.	Filament supply for tubes V1, V2 and V5, and bias supply voltage.
V5	ABCDE	2T145	TUBE JAN 5Z3 (VT–145): duo-diode.	Bias supply rectifier.

33. High-Voltage Power Supply Stage *(fig. 36)*

a. Circuit Repair Features. The high voltage rectifier is equipped with rectifier tubes V6 and V7. The secondary winding of transformer T2 supplies filament voltage for tubes V6 and V7. The secondary winding of transformer T6 supplies plate power. The primary of transformer T6 is connected to the a-c line during transmission, and is provided with a tap for raising the voltage applied to the plate of the class C amplifier during c-w transmission in order to obtain high power output. The rectified high voltage supplied by tubes V6 and V7 is filtered by choke L4 and capacitors C19 and C23. The output of the high-voltage power supply is shunted by bleeder resistor R13. In making high-voltage measurements on this stage reread and follow the precaution and procedure outlined in paragraph 22*d* (1) *(d)*.

b. Parts Data for High-Voltage Power Supply.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C19, C23	ABCDE	3DB3.8	CAPACITOR, fixed: 3-mf, −10% +40%; 4,000 vdcw; oil-filled.	Final amplr h-v supply filter.
L4	ABCDE	3C560–1	REACTOR: 11-h; 500-ma; 50-ohm; 5,000 v d-c test; Standard Trans. Corp. 10C16.	Final amplr supply filter.
R13	ABCDE	3Z6675–15	RESISTOR: 75,000-ohm; 200-watt; type 0924.	Final amplr h-v supply bleeder.
RY2	ABCDE	2Z7717.5	RELAY: DPDT; 117 v ac; type G32423.	Overload protector.
RY5	ABCDE	2Z7717.4	RELAY: DPST; 800 ma dc; type G32422.	Overload protection in high-voltage.
T2	ABCDE	2Z9611.144	TRANSFORMER: pri, 115-100-v a-c; sec, 2.5-v ct at 10 amps; 10,000-v rms break-down.	Filament supply for tubes V6 and V7.
T6	ABCDE	2Z9612.1	TRANSFORMER: pri, 115-v ac; tapped to provide sec voltage 5,000 v or 4,000 v at 500 ma.	Plate transformer of h-v power supply.
V6 V7	ABCDE	2T46A	TUBE JAN–866 (VT–46A): diode.	H-v rectifier.

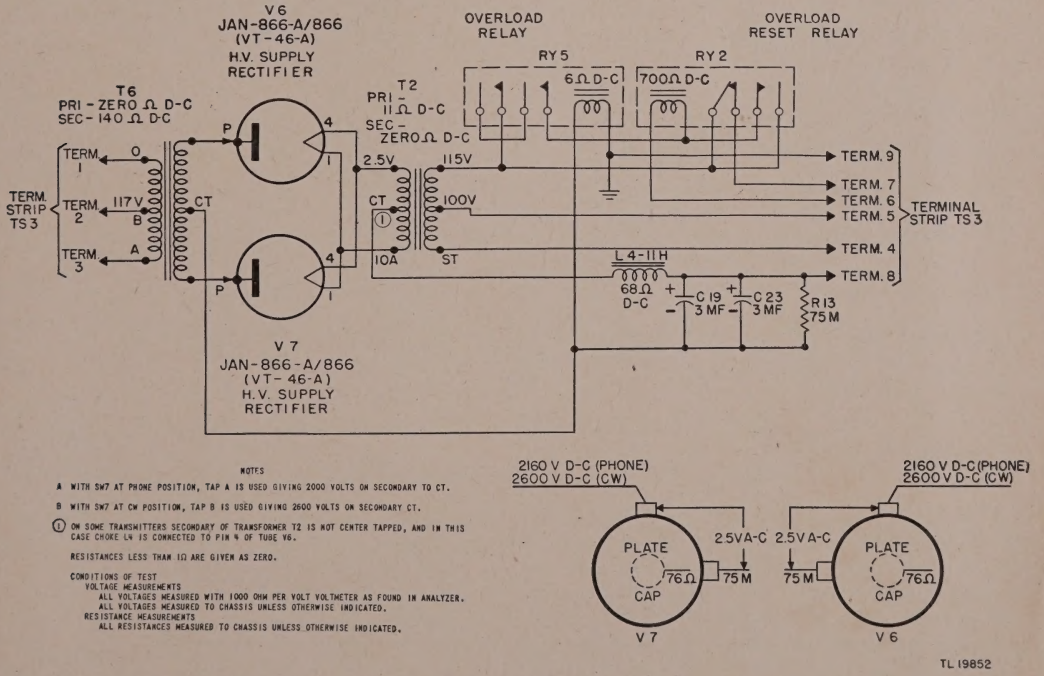


Figure 36. Radio Transmitter BC–610–(*), high voltage power supply stage, schematic wiring diagram.

34. Meter Switching for Radio Transmitters BC–610–A Through –D *(figs. 37 and 38)*

a. Circuit Repair Features. (1) Meter M1 is a 0- to 100-ma, d-c instrument which indicates the grid current of either intermediate-amplifier tubes V10 and V11 or of p-a tube V16 depending on the position of switch SW8. Resistors R26 and R27 are meter shunts which remain at all times in the p-a grid circuit and the intermediate-amplifier grid circuit respectively. In Radio Transmitters BC–610–A and –B, switch SW8 is connected as a double-pole, double-throw switch, and a separate grid return wire to bias resistor R11 is used for the p-a and intermediate-amplifier grid circuits. In Radio Transmitters BC–610–C and –D, switch SW8 is connected as a single-pole, single-throw switch, and a common grid return wire to bias resistor R11 is used for both the p-a and intermediate-amplifier grid circuits.

(2) Meter M2 is a 0- to 300-ma, d-c instrument which indicates the plate currents of buffer-doubler tube V9 or intermediate-amplifier tubes V10 and V11, depending on the position of switch SW9. This meter is connected in series with the B+ lead on the power supply in the r-f section.

(3) Filament voltmeter M3 is a 0- to 10-volt, a-c instrument connected across the filament of tube V16 for the purpose of checking the filament voltages. The filament voltages are adjusted by means of variable resistor R18. A reading of 5.3 volts on this meter indicates that all of the filaments are operating at their proper value.

(4) Meter M4 is a 0- to 300-ma, d-c instrument which indicates the plate current of the modulator tubes V3 and V4. This meter is connected on the low side of the circuit between the center tap of filament transformer T3 and ground (B–).

(5) Meter M5 is a 0- to 500-ma, d-c instrument which indicates the plate current of the class C amplifier tube V16, and is connected between the plate of this tube and B+ of the high-voltage power supply.

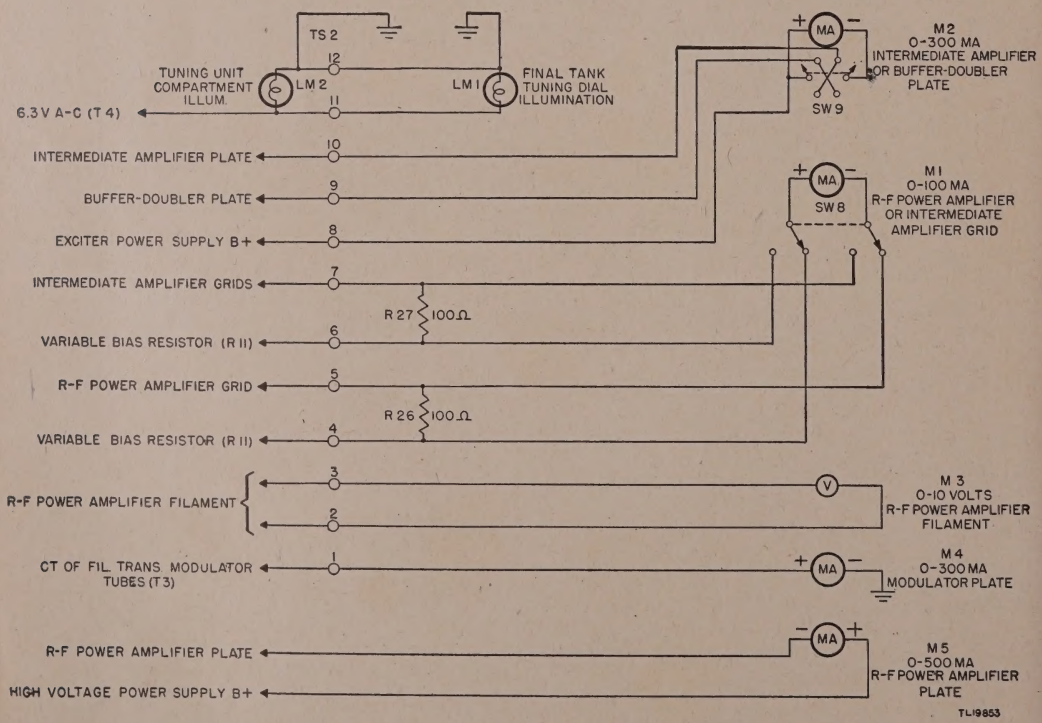


Figure 37. Radio Transmitters BC–610–A and BC–610–B, meter switching, functional diagram.

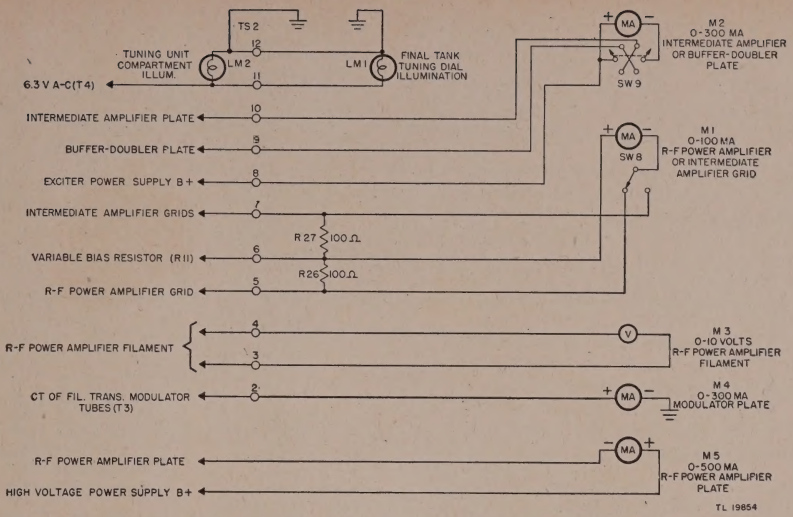


Figure 38. Radio Transmitters BC–610–C and BC–610–D, meter switching, functional diagram.

b. Parts Data for Meter Switching of Radio Transmitters BC–610–A Through –D.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
LM1	ABCD	2Z5927	LAMP: 6- to 8-v; 0.25-amp; bayonet base.	Final tank tuning dial illumination.
LM2	ABCD	2Z5927	LAMP: 6- to 8-v; 0.25-amp; bayonet base.	Tuning unit compartment illumination.
M1	ABCD	3F910–13	MILLIAMMETER: 0- to 100-ma dc; bakelite case; substitute War Standard Meter No. MR25W100DCMA. G.E. DO–53.	Tubes V16, V10, and V11 grid current indicator.
M2	ABCD	3F930–10	MILLIAMMETER: 0- to 300-ma dc; type DO–53.	Tubes V9, V10, and V11 plate current indicator.
M3	ABCD	3F8010–8	VOLTMETER: 0- to 10-v ac; type DO–53.	Tube V16 filament voltage indicator.
M4	ABCD	3F930–10	MILLIAMMETER: 0- to 300-ma dc; bakelite case; substitute War Standard Meter No. MR25W300DCMA. G.E. DO–53.	Tubes V3 and V4 plate current indicator.
M5	ABCD	3F950–20	MILLIAMMETER: 0- to 500-ma dc; bakelite case; substitute War Standard Meter No. MR25W500-DCMA. G.E. DO–53.	Tube V16 plate current indicator.
R26	ABCD	3Z6010–27	RESISTOR: 100-ohm, ±5%; 1-watt; type BW–1.	Shunt for meter M1.
R27	ABCD	3Z6010–27	RESISTOR: Same as R26.	Shunt for meter M1.
SW8	ABCD	3Z9845–15	SWITCH: DPDT; toggle; type 8363KS.	M1 meter switching.
SW9	ABCD	3Z9845–15	SWITCH: DPDT; toggle; type 8363KS.	M2 meter switching.
TS2	ABCD	2Z9412	TERMINAL STRIP: 12-terminal; type 12–6; special.	Exciter chassis cable connections.

35. Meter Switching for Radio Transmitter BC–610–E *(fig. 39)*

a. Circuit Repair Features. (1) Meter M1 is a multiple-scale, d-c milliammeter which indicates the value of any one of the following depending on the position of switch SW8:

(a) Buffer-doubler (tube V9) plate current.

(b) Intermediate-amplifier (tubes V10 and V11) grid current.

(c) Intermediate-amplifier (tubes V10 and V11) plate current.

(d) P-a (tube V16) grid current.

A meter shunt, which remains in the circuit at all times, is provided for each position of switch SW8. In switch position 1 (DOUB. PLATE), the meter shunt is resistor R33, and the meter is connected between the buffer-doubler plate and the B+ lead on the power supply in the r-f sec-

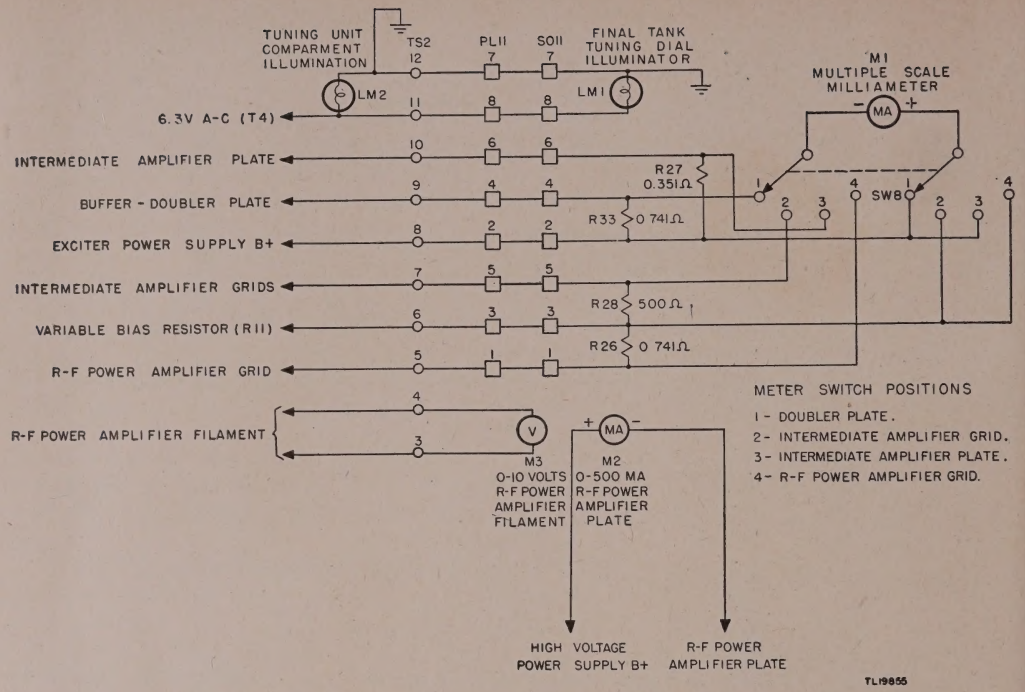


Figure 39. Radio Transmitter BC–610–E, meter switching, functional diagram.

tion. In switch position 2 (INT. AMP. GRID) the meter shunt is resistor R28, and the meter is connected between the intermediate-amplifier grids and bias resistor R11. In switch position 3 (INT. AMP. PLATE) the meter shunt is resistor R27, and the meter is connected between the intermediate-amplifier plates and the B+ lead on the power supply in the r-f section. In switch position 4 (P.A. GRID) the meter shunt is resistor R26, and the meter is connected between the p-a grid and bias resistor R11.

(2) Meter M2 is a 0- to 500-ma, d-c instrument which indicates the plate current of the class C p-a tube V16, and is connected between the plate of this tube and B+ of the high-voltage power supply.

(3) Meter M3 is the same as meter M3 for Radio Transmitters BC–610–A through –D. (See par. 34*a*(3).)

b. Parts Data for Meter Switching of Radio Transmitter BC–610–E.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
LM1	E	2Z5927	LAMP: 6-8-v; 0.25-amp; bayonet base.	Final tank tuning dial illumination.
LM2	E	2Z5927	LAMP: 6-8-v; 0.25-amp; bayonet base.	Tuning unit compartment illumination.
M1	E	3F901E5–14	MILLIAMMETER: d-c; multiple scale; 0–15, 0–150, 0–300 ma.	Tubes V16, V10, V11, and V9 current indicator.
M2	E	3F950–20	MILLIAMMETER: 0-500-ma d-c; type DO–53.	Tube V16 plate current indicator.
M3	E	3F8010–20	VOLTMETER: 0-10-v ac; type DO–53.	Tube V16 filament voltage indicator.
PL11	E	2Z7228–1	PLUG: 8-contact; male; type P–408–LAB.	Lower control panel to mod chassis cable plug.

b. Parts Data for Meter Switching of Radio Transmitter BC–610–E (contd.).

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
R26	E	3F3802–150	RESISTOR: wire-wound; 741-ohm, ±5%; temp coef 0.015% special.	Shunt for M1, 150-ma range.
R27	E	3F3802–300	RESISTOR: wire-wound; 351-ohm, ±5%; temp coef 0.015% special.	Shunt for M1, 300-ma range.
R28	E	3Z6050–41	RESISTOR: wire-wound; 500-ohm, ±10%; ½-watt.	Shunt for M1, 15-ma range.
R33	E	3F3802–150	RESISTOR: wire-wound; 741-ohm, ±5%; temp coef 0.015% special.	Shunt for M1, 150-ma range.
SO11	E	2Z3069–20	SOCKET: 8-terminal; female; type S–408–AB modified.	Socket on upper control panel for plug PL 11.
SW8	E	3Z9825–29.13	SWITCH, rotary: 2-section; 4-position; ceramic wafers.	Switch for M1.
TS2	E	2Z9412.27	TERMINAL STRIP: 12-terminal; special.	Exciter chassis cable connections.

36. Antenna Tuning Unit BC–729–( ) *(fig. 40)*

a. Circuit Repair Features. Radio Transmitters BC–610–A through –D are equipped with Antenna Tuning Unit BC–729–(*) which couples the output of the transmitter to the antenna. The r-f energy is delivered to the primary of adjustable coupling transformer L5 through a concentric transmission line. This adjustable coupling transformer which is controlled from the front panel, regulates the amount of power taken from the transmitter and fed to the antenna circuit. In series with the coupling transformer secondary are antenna current meter M6, capacitor C30 (which may be switched in or out of the circuit), antenna-loading coil L6, and the antenna proper. Antenna-loading coil L6 is a variable inductor which tunes the antenna to resonance. Coupling transformer L5 is adjusted until normal p-a plate current is obtained as indicated on the P.A. PLATE meter. When antenna-loading coil L6 is adjusted so that it tunes the antenna circuit to resonance, the antenna circuit absorbs the greatest possible amount of energy from the transmitter. Because of decreased antenna reactance, at frequencies between 6 and 8 mc, capacitor C30 is introduced in series with the antenna-loading coil by means of switch SW14 so that the adjustment of inductor L6 becomes less critical.

CAUTION: Because the antenna is short, a high r-f voltage is built up in the antenna-tuning unit during operation. Guard against receiving severe r-f burns.

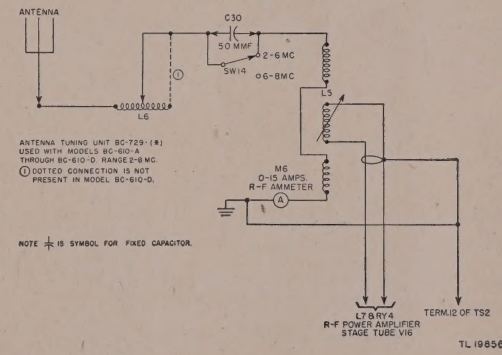


Figure 40. Antenna Tuning Unit BC–729–(*), schematic wiring diagram.

b. Parts Data for Antenna Tuning Unit BC–729.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C30	ABCD	3D423	CAPACITOR CA–423: 50-mmf; vacuum; 32,000-v ac; type VC–50.	Impedance matching.
L5	ABCD	3C302B–1	COIL: r-f; 7-turn; variable link coupling coil; special.	Ant. pick-up inductor.
L6	ABCD	3C302B–2	COIL: r-f; variable inductance; special.	Ant. loading inductor.
M6	ABCD	3F1015–18	AMMETER: r-f; 0-15-amp; type GE DO–53.	Ant. current inductor.
SW14	AB	3Z9825–29	SWITCH: rotary ant. range switch assem; special; SPST.	Ant. series capacitor shorting.

37. Antenna Tuning Unit BC–939–A *(fig. 41)*

a. Circuit Repair Features. Radio Transmitter BC–610–E is equipped with Antenna Tuning Unit BC–939–A which couples the output of the transmitter to the antenna. The r-f energy is delivered to the primary of adjustable coupling transformer L5 through a concentric transmission line. This coupling which is controlled from the front panel, adjusts the amount of power taken from the transmitter and fed to the antenna circuit. In series with the coupling coil secondary are antenna current meter M4, capacitor C22 and C30 (which are selected by switch SW9), two variable inductors L6 and L44, and the antenna proper. Inductor L6 or L44 is an antenna loading coil which tunes the antenna to resonance, and the coupling transformer L5 is adjusted until normal p-a plate current is obtained as indicated on the P. A. PLATE meter. When inductor L6 or L44 is adjusted so that it tunes the antenna circuit to resonance, the antenna circuit absorbs the greatest possible amount of energy from the transmitter. Inductor L6 is used to tune to frequencies from 2 to 10 mc. Because of decreased antenna reactance, at frequencies between 6 and 10 mc, capacitor C30 is introduced in series with the antenna loading coil by means of switch SW9 so that adjustment of inductor L6 becomes less critical. At frequencies between 10 and 18mc, inductor L44 and series capacitor C22 are switched into the series antenna circuit in place of inductor L6 by means of switch SW9.

CAUTION: Because the antenna is short a high r-f voltage is built up in the antenna tuning unit during operation. Guard against receiving severe r-f burns.

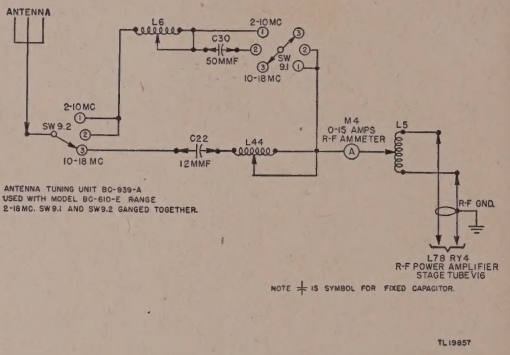


Figure 41. Antenna Tuning Unit BC–939–A, schematic wiring diagram.

b. Parts Data for Antenna Tuning Unit BC–939–A.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C22	E	3D9012–32	CAPACITOR, fixed: vacuum; 12-mmf, −1% +½%; 20,000 vdcw; type VC–12.	Impedance-matching capacitor.
C30	E	3D423	CAPACITOR CA–423 fixed; vacuum; 50-mmf; 32,000 v ac; type VC–50.	Impedance-matching capacitor.
L5	E	3C302B–3	INDUCTOR ASSEMBLY: replacement coupling; special.	Coupling inductor.
L6	E	3C302B–2	COIL, r-f: variable inductance; special.	Low-frequency loading.
L44	E	3C302B–4	INDUCTOR, h-f: replacement; special.	High-frequency loading.
M4	E	3F1015–18	AMMETER: r-f: 0-15-amp; type GE DO–53.	Ant. current indicator.
SW9.1	E	2C527939A/S4	SWITCH ASSEMBLY: front section; isolantite.	Inductor selector.
SW9.2	E	2C527939A/S4	SWITCH ASSEMBLY: rear section; isolantite.	Inductor selector.

38. Tuning Units for Radio Transmitter BC–610–(*) *(fig. 42)*

a. General. The transmitter is equipped with three tuning units, each of which may be selected by the BAND SWITCH. Each tuning unit in combination with a coil unit may be tuned to a separate frequency. Radio Transmitters BC–610–A and BC–610–B are equipped with six tuning boxes and four tank coils each of which covers a specified band within the frequency range of 2 to 8 mc. Radio Transmitters BC–610–C and BC–610–D are equipped with six tuning units and four coil units each of which covers a specified band within the same range. Radio Transmitters BC–610–E is equipped with eight tuning units and seven coil units each of which covers a specified band within the range of 2 to 18 mc. For each frequency there is a particular combination of tuning box or tuning unit, tank coil or coil unit, and tuning control settings which is required for proper performance. These combinations are listed in the tuning charts (sec. IX, figs.

60 through 65) for Radio Transmitter BC–610–A through BC–610–D and in tuning charts (sec. IX, figs. 66 through 73) for Radio Transmitter BC–610–E. Since there are three complete sets of tuning units available, it is possible to install three tuning units of the same range which can be covered by one coil unit, or the tuning units may cover two or more frequency ranges. In selecting the tuning units for the desired range, consult tables V and VI.

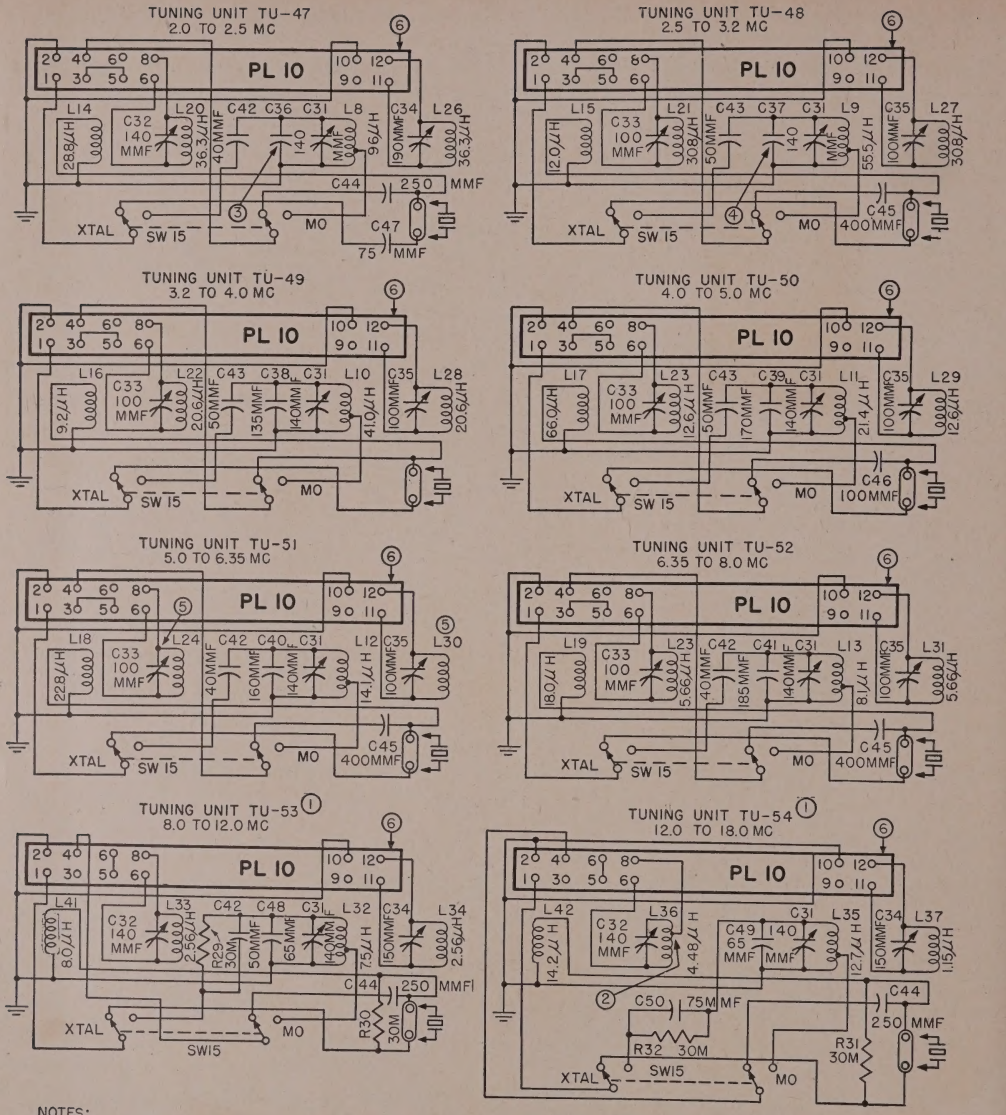
b. Parts Data for Tuning Units. (1) *Tuning Unit TU–47 (2.0 to 2.5 mc).*

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C31	ABCDE	3D9140V–7	CAPACITOR, variable: 140-mmf max; air; type 140K8.	Master-osc tuning capacitor.
C32	ABCDE	3D9140V–7	CAPACITOR, variable: 140-mmf max; air.	Buffer-doubler tuning capacitor.
C34	ABCD		CAPACITOR, variable: 150-mmf max; type MC1857.	Intermediate-amplifier tuning capacitor.
C34	E	3D9190V	CAPACITOR, variable: 190-mmf max.	Intermediate-amplifier tuning capacitor.
C36	ABCD	3D140–1	CAPACITOR, fixed: 140-mmf, ±5%; temp coef 0.00015; 500 vdcw. type C–865.	Master-osc padding capacitor.
C36	E	3D140–1	CAPACITOR, fixed: 155-mmf, ±2%; temp coef 0.00015; 500 vdcw; special.	Master-osc padding capacitor.
C42	ABCDE	3D9040–1	CAPACITOR, fixed: 40-mmf, ±5%; temp coef zero; 500 vdcw; ceramic; type C–865; (special for BC–610–E).	Grid coupling capacitor.
C44	ABCDE	3D9250–20	CAPACITOR, fixed: 250-mmf, ±10%; 500 vdcw; type 5W.	Cathode coupling capacitor.
C47*	ABCDE		CAPACITOR, fixed: 75-mmf, ±20%; 500 vdcw; mica; type 5W.	Crystal coupling capacitor.
L8	ABCDE	3C1090	COIL: r-f; 96-μh; tapped; special; type 4846.	Master-osc inductor.
L14	ABCDE	3C1090–6	COIL: r-f: 28-μh; single-winding; type 4881.	Crystal-osc inductor.
L20	ABCDE	3C1090–12	COIL: r-f; 36.3-μh; single-winding; special; type 4872.	Buffer-doubler inductor.
L26	ABCDE	3C1090–12	COIL: r-f: 36.3-μh; single-winding; special; type 4872.	Intermediate-amplifier inductor.
PL10	ABCDE	2Z7228–10.1	PLUG: 12-prong; bakelite; type Z–149.	Tuning unit base and terminal prongs.
SW15	ABCDE	3Z9858–3	SWITCH: DPDT; toggle.	M.O.–XTAL switching.

*Parts listed without Signal Corps stock numbers are not available, and are shown here for information only.

(2) *Tuning Unit TU–48 (2.5 to 3.2 mc).*

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C31	ABCDE	3D9140V–7	CAPACITOR, fixed: 140-mmf max; air; type 140 K8.	Master-osc tuning capacitor.
C33	ABCDE	3D9100V–8	CAPACITOR, fixed: 100-mmf max; air; type 100 K8.	Buffer-doubler tuning capacitor.
C35	ABCDE	3D9100V–9	CAPACITOR, variable: 100-mmf max; air; type MC1855.	Intermediate-amplifier tuning capacitor.
C37	ABCDE	3D9155–1	CAPACITOR, fixed: 155-mmf, ±5%; temp coef 0.00015; 500 vdcw; ceramic; type C–866.	Master-osc padding capacitor.
C37	E	3D9155–1	CAPACITOR, fixed: 160-mmf, ±2%; temp coef 0.00015; 500 vdcw; ceramic special.	Master-osc padding capacitor.
C43	ABCDE	3D9050–61	CAPACITOR, fixed: 50-mmf, ±5%; temp coef zero; 500 vdcw; type C–873; (special for BC–610–E).	Grid coupling capacitor.
C45	ABCDE	3D9400–16	CAPACITOR, fixed: 400-mmf, ±10%; 500 vdcw; mica; type 5W.	Cathode coupling capacitor.
L9	ABCDE	3C1090–1	COIL: r-f; 55.5-μh; topped; special.	Master-osc inductor.
L15	ABCDE	3C1090–7	COIL: r-f; 12.0-μh; single-winding; special.	Crystal-osc inductor.
L21	ABCDE	3C1090–13	COIL: r-f; 30.8-μh; single-winding; special.	Buffer-doubler indicator.
L27	ABCDE	3C1090–13	COIL: r-f; 30.8-μh; single-winding; special.	Intermediate-amplifier indicator
PL10	ABCDE	2Z7228–10.1	PLUG: 12-prong; bakelite; type Z–149.	Tuning unit base and terminal prongs.
SW15	ABCDE	3Z9858–3	SWITCH: DPDT; toggle.	MO–XTAL switching.



NOTES:

① TUNING UNITS TU-53 AND TU-54 ARE USED ONLY ON BC-610-E.

② ON SOME EQUIPMENTS, L36 IS UNTAPPED AND WIRE FROM TERMINAL NO.8 OF PL10 IS CONNECTED TO THE STATIONERY PLATE OF C32.

③ C36 IS 140-MMF-MODELS BC-610-A THROUGH BC-610-D.
C36 IS 155 MMF-MODEL BC-610-E.

④ C37 IS 155 MMF-MODELS BC-610-A THROUGH BC-610-D.
C37 IS 160 MMF-MODEL BC-610-E.

⑤ L24 AND L30 ARE 8.6μH-MODELS BC-610-A THROUGH BC-610-D.
L24 AND L30 ARE 12.6μH-MODEL BC-610-E.

⑥ ALL PLUG STRIPS PL 10 SHOWN ON PRONG SIDE.

TL 19859

⏤ IS SYMBOL FOR FIXED CAPACITOR. M=1,000 Ω

⏤ IS SYMBOL FOR VARIABLE CAPACITOR.

Figure 42. Radio Transmitter BC-610-(*) tuning units, schematic wiring diagram.

(3) *Tuning Unit TU–49 (3.2 to 4.0 mc).*

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C31	ABCDE	3D9140V–7	CAPACITOR, variable: 140-mmf max; air; type 140 K8.	Master-osc tuning capacitor.
C33	ABCDE	3D9100V–8	CAPACITOR, variable: 100-mmf max; air; type 100 K8.	Buffer-doubler tuning capacitor.
C35	ABCDE	3D9100V–9	CAPACITOR, variable: 100-mmf max; air; type MC 1855.	Intermediate amplifier tuning capacitor.
C38	ABCDE	3D9135–2	CAPACITOR, fixed: 135-mmf, ±2%; temp coef 0.00015; 500 vdcw; type C–867; (special for BC–610–E).	Master osc padding capacitor
C43	ABCDE	3D9050–61	CAPACITOR, fixed: 50-mmf, ±5%; temp coef 0.00015; 500 vdcw; type C873; (special for BC–610–E).	Grid coupling capacitor.
L10	ABCDE	3C1090–2	COIL: r-f; 41.0-μh; tapped; special; type 4848.	Master-osc inductor.
L16	ABCDE	3C1090–8	COIL: r-f; 9.2-μh; single-winding; special; type 4883.	Crystal inductor.
L22	ABCDE	3C1090–14	COIL: r-f; 20.6-μh; single-winding; special; type 4874.	Buffer-doubler inductor.
L28	ABCDE	3C1090–14	COIL: r-f; 20.6 μh; single-winding; special; type 4874.	Intermediate-amplifier inductor.
PL10	ABCDE	2Z7228–10.1	PLUG: 12-prong; bakelite, type Z–149.	Tuning unit base and terminal prong.
SW15	ABCDE	3Z9858–3	SWITCH: DPDT; toggle.	MO–XTAL switch.

(4) *Tuning Unit TU–50 (4.0 to 5.0 mc).*

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C31	ABCDE	3D9140V–7	CAPACITOR, variable: 140-mmf max; type 140K8.	Master-osc tuning capacitor.
C33	ABCDE	3D9100V–8	CAPACITOR, variable: 100-mmf max; type 100K8.	Buffer-doubler tuning capacitor.
C35	ABCDE	3D9100V–9	CAPACITOR, variable: 100-mmf max; type MC1855.	Intermediate-amplifier tuning capacitor.
C39	ABCDE	3D9170–1	CAPACITOR, fixed: ceramic; 170-mmf, ±2%; temp coef 0.00015; 500 vdcw; type C–868 (special for BC–610–E).	Master-osc padding capacitor.
C43	ABCDE	3D9050–61	CAPACITOR, fixed: 50-mmf, ±5%; ceramic; temp coef zero; 500 vdcw; type C–873 (special for BC–610–E).	Grid coupling capacitor.
C46	ABCDE	3D9100–67	CAPACITOR, fixed: mica; 100-mmf, ±10%; 500 vdcw; type 5W.	Cathode coupling capacitor.
L11	ABCDE	3C1090–3	COIL: r-f; 21.4-μh, tapped; special; type 4849.	Master-osc inductor.
L17	ABCDE	3C1090–9	COIL: r-f; 66.0-μh; single-winding; special; type 4884.	Crystal-osc inductor.
L23	ABCDE	3C1090–15	COIL: r-f; 12.6-μh; single-winding; special; type 4875.	Buffer-doubler inductor.
L29	ABCDE	3C1090–15	COIL: r-f; 12.6-μh; single-winding; special; type 4875.	Intermediate-amplifier inductor.
PL10	ABCDE	2Z7228–10.1	PLUG: special; 12-prong; bakelite; type Z–149.	Tuning unit base and terminal prongs.
SW15	ABCDE	3Z9858–3	SWITCH: DPDT; toggle.	MO–XTAL switching.

(5) *Tuning Unit TU–51 (5.0 to 6.35 mc).*

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C31	ABCDE	3D9140V–7	CAPACITOR, variable: air; 140-mmf max; type 140K8.	Master-osc tuning capacitor.
C33	ABCDE	3D9100V–8	CAPACITOR, variable: air; 100-mmf; max; type 100K8.	Buffer-doubler tuning capacitor.
C35	ABCDE	3D9100V–9	CAPACITOR, variable: air; 100-mmf max; type MC1855.	Intermediate-amplifier tuning capacitor.
C40	ABCDE	3D9160	CAPACITOR, fixed: 160-mmf; ±5%; ceramic; temp coef 0.00015; 500 vdcw; type C–869 (special for BC–610–E).	Master-osc padding capacitor.

(5) *Tuning Unit TU–51 (5.0 to 6.35 mc). (contd).*

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C42	ABCDE	3D9040–10	CAPACITOR, fixed: 40-mmf, ±5%; ceramic; temp coef zero; 500 vdcw; type C–872 (special for BC–610–E).	Grid coupling capacitor.
C45	ABCDE	3D9400–16	CAPACITOR, fixed: 400-mmf, ±20%; mica; 500 vdcw; type SW.	Cathode coupling capacitor.
L12	ABCDE	3C1090–4	COIL: r-f; 14.1-μh; tapped; special; type 4850.	Master-osc inductor.
L18	ABCDE	3C1090–10	COIL: r-f; 22.8-μh; single-winding; special; type 4900.	Crystal-osc inductor.
L24	ABCD	3C1090–16	COIL: r-f; 8.6-μh; single-winding; special; type 4876.	Buffer-doubler inductor.
L24	E	3C1090–16	COIL: r-f; 12.6-μh; single-winding; special.	Buffer-doubler inductor.
L30	ABCD	3C1090–16	COIL: r-f; 8.6-μh; single-winding; special; type 4876.	Intermediate-amplifier inductor.
L30	E	3C1090–16	COIL: r-f; 12.6-μh; single-winding; special.	Intermediate-amplifier inductor.
PL10	ABCDE	2Z7228–10.1	PLUG: special; 12-prong; bakelite; type Z-149.	Tuning unit base and terminal prongs.
SW15	ABCDE	3Z9858–3	SWITCH: DPDT; toggle.	MO-XTAL switching.

(6) *Tuning Unit TU–52 (6.35 to 8.0 mc).*

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C31	ABCDE	3D9140V–7	CAPACITOR, variable: air; 140-mmf max; type 140K8.	Master-osc tuning capacitor.
C33	ABCDE	3D9100V–8	CAPACITOR, variable: air; 100-mmf max; type 100K8.	Buffer-doubler tuning capacitor.
C35	ABCDE	3D9100V–9	CAPACITOR, variable: air; 100-mmf max; type MC1855.	Intermediate-amplifier tuning capacitor.
C41	ABCDE	3D9185–1	CAPACITOR, fixed: 185-mmf, ±5%; ceramic; temp coef −0.00015; 500 vdcw; type C–870 (special for BC–610–E).	Master-osc padding capacitor.
C42	ABCDE	3D9040–10	CAPACITOR, fixed: 40-mmf, ±5%; ceramic; temp coef–0.00015; 500 vdcw; type C–872 (special for BC–610–E).	Grid coupling capacitor.
C45	ABCDE	3D9400–16	CAPACITOR, fixed: 400-mmf, ±20%; mica; 500 vdcw.	Cathode coupling capacitor.
L13	ABCDE	3C1090–5	COIL: r-f; 8.1-μh; tapped; special; type 4851.	Master-osc inductor.
L19	ABCDE	3C1090–11	COIL: r-f; 18.0-μh; single-winding; special; type 4901.	Crystal-osc inductor.
L25	ABCDE	3C1090–17	COIL: r-f; 5.66-μh; single-winding; special; type 4877.	Buffer-doubler inductor.
L31	ABCDE	3C1090–17	COIL: r-f; 5.66-μh; single-winding; special; type 4877.	Intermediate-amplifier inductor.
PL10	ABCDE	2Z7228–10.1	PLUG: special; 12-prong; bakelite; type Z–149.	Tuning unit base and terminal prongs.
SW15	ABCDE	3Z9858–3	SWITCH: DPDT; toggle.	MO–XTAL switching.

c. Parts Data for Tuning Unit TU–53.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
R29	ABCDE	3Z4540	RESISTOR: 30,000-ohm, ±10%; ½-watt; carbon.	Master-oscillator grid leak.
R30	ABCDE	3Z4540	RESISTOR: 30,000-ohm, ±10%; ½-watt; carbon.	Crystal-oscillator grid leak.
C31	ABCDE	3D9140V–7	CAPACITOR, variable: 140-mmf max; air.	Master-oscillator tuning capacitor.
C32	ABCDE	3D9140V–7	CAPACITOR, variable: 140-mmf max; air.	Buffer-doubler tuning capacitor.
C34	ABCDE	3D9190V	CAPACITOR, variable; 190-mmf max; air.	Intermediate-amplifier tuning capacitor.
C42	ABCDE	3D9050–61	CAPACITOR, fixed: 50-mmf, ±5%; ceramic; temp coef zero; 500 vdcw; special.	Grid coupling capacitor.
C44	ABCDE	3D9250–20	CAPACITOR, fixed: 250-mmf, ±20%; 500 vdcw; mica; type O.	Cathode coupling capacitor.

c. Parts Data for Tuning Unit TU–53 (contd).

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
C48*	ABCDE		CAPACITOR, fixed: 65-mmf, ±2%; 500 vdcw; ceramic; temp coef −0.00015; special.	Master-osc padding capacitor.
L32	ABCDE		COIL, r-f: 7.5-μh; tapped; special.	Master-osc inductor.
L33	ABCDE		COIL, r-f; 2.56-μh; single-winding; special.	Buffer-doubler inductor.
L34	ABCDE		COIL, r-f: 2.56-μh single-winding; special.	Intermediate-amplifier inductor.
L41	ABCDE		COIL, r-f; 8.0-μh; single-winding; special.	Crystal-osc inductor.
PL10	ABCDE	2Z7228–10.1	PLUG: 12-prong; bakelite; special.	Tuning unit base and termina prongs.
SW15	ABCDE	3Z9858–3	SWITCH: DPDT; toggle.	MO-XTAL switching.

*Parts listed without Signal Corps stock numbers are not available, and are shown here for information only.

d. Parts Data for Tuning Unit TU–54.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
R31	ABCDE	3Z4540	RESISTOR: 30,000-ohm, ±10%; ½-watt; carbon type MB1/2.	Crystal-oscillator grid resistor.
R32	ABCDE	3Z4540	RESISTOR: 30,000-ohm, ±10%, ½-watt; carbon; type MB1/2.	Master-oscillator grid resistor.
C31	ABCDE	3D9140V–7	CAPACITOR, variable: 140-mmf max; air.	Master-osc tuning capacitor.
C32	ABCDE	3D9140V–7	CAPACITOR, variable: 140-mmf max; air.	Buffer-doubler tuning capacitor.
C34	ABCDE	3D9190V	CAPACITOR, variable: 190-mmf max; air.	Intermediate-amplifier tuning capacitor.
C44	ABCDE	3D9250–20	CAPACITOR, fixed: 250-mmf, ±20%; 500 vdcw; mica; type 0.	Cathode coupling capacitor.
C49*	ABCDE		CAPACITOR, fixed: 65-mmf, ±2%, 500 vdcw; ceramic; temp coef–0.00015; special.	Master-osc padding capacitor.
C50	ABCDE	3D9075–7	CAPACITOR, fixed: 75-mmf, ±5%; 500 vdcw; ceramic; temp coef–0.00075; special.	Grid coupling capacitor.
L35	ABCDE		COIL, r-f: 12.7–μh; tapped; special.	Master-osc inductor.
L36	ABCDE		COIL, r-f: 4.48–μh; tapped; special.	Buffer-doubler inductor.
L37	ABCDE		COIL, r-f: 1.15–μh; tapped; special.	Intermediate-amplifier inductor.
L42	ABCDE		COIL, r-f: 14.2–μh; single-winding; special.	Crystal-osc inductor.
PL10	ABCDE	2Z7228–10.1	PLUG: 12-prongs; bakelite; special.	Tuning unit base and terminal base.
SW15	ABCDE	3Z9858–3	SWITCH: DPDT, toggle.	MO–XTAL switching.

*Parts listed without Signal Corps stock numbers are not available, and are shown here for information only.

39. Miscellaneous Parts for Radio Transmitter BC–610–(*)

a. General. There are parts in Radio Transmitter BC–610–(*) which are not located in any particular stage, and for that reason have not been included on the stage diagrams and parts data for the stages. These parts are listed separately in two groups depending on the transmitter to which they belong.

b. Miscellaneous Parts Data for Radio Transmitters BC–610–A through –D.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
FS1, FS2	ABCD	3Z2025	FUSE: plug; 25-amp; 125-v; type 5725.	Line fuse.
FS3	ABCD	3Z2020	FUSE: plug; 20-amp; 125-v; type 5120.	Transformer T6 primary.
FS4	ABCD	3Z1935	FUSE: 5-amp; 250-v; type 1358.	Protects T2, T3, T4, T5, RY1, RY2, RY3, RY4, and LM3.
FS5	ABCD	3Z1950	FUSE: 3-amp; 250-v; type 1043.	Protects T1 and Speech Amplifier BC–614–( ) power supply primaries.
LM3	ABCD	2Z5903	LAMP: 120-v; 6-watt.	Filament ON-OFF indicator.
LM4	ABCD	2Z5903	LAMP: 120-v; 6-watt.	H-v power supply ON-OFF indicator.

b. Miscellaneous Parts Data for Radio Transmitters BC–610–A through –D (Contd.).

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
PL1, PL2	ABCD	2Z8639	SOCKET: 6-contact; female; type S–406–LAB.	Sockets on mod chassis for plugs PL1.1 and PL2.1.
PL3	ABC	2Z8639	SOCKET: 6-contact; female; type S–406–LAB.	Socket on mod chassis for plug PL3.1.
PL3	D	2Z3069–20	SOCKET: 8-contact; female; type S–408–LAB.	Socket on mod chassis for plug PL3.1.
PL4	ABCD	2Z8639	SOCKET: 6-contact; female; type S–406–AB.	Socket on mod chassis for plug PL4.1.
PL5	ABCD	2Z8659–6	SOCKET: 8-contact; female; bakelite; Amphenol type MIP–8.	Speech amplifier input connection on Radio Transmitter BC–610–(*).
PL6	ABCD	2Z3099–1	SOCKET: male; twist lock; 20-amp; 250-volt; type 8808.	110-volt a-c power input connection.
PL7	ABCD	2Z8639–5	SOCKET: 12-terminal; bakelite; type 12–42.	Channel 1 tuning unit socket.
PL8	ABCD	2Z8639–5	SOCKET: 12-terminal; bakelite; type 12–42.	Channel 2 tuning unit socket.
PL9	ABCD	2Z8639–5	SOCKET: 12-terminal; bakelite; type 12–42.	Channel 3 tuning unit socket.
PL1.1, PL2.1	ABCD	2Z7116.22	PLUG: 6-contact; male; type P–406–LAB.	R–f section to mod chassis cable plug.
PL3.1	ABC	2Z7116.22	PLUG: 6-contact; male; type P–406–LAB.	Panel to mod chassis cable plug.
PL3.1	D	2Z7228–1	PLUG: 8-contact; male; type P–408–LAB.	Panel to mod chassis cable plug.
PL4.1	ABCD	2Z7116.22	PLUG: 6-contact; male; type P–406–LAB.	Panel to mod chassis cable plug.
R12	ABCD	2Z7261	POTENTIOMETER: wire-wound; 500-ohm; 50-watt; type PR–50.	Tubes V3 and V4 bias voltage control.
R18	ABCD	3Z7015–3	RHEOSTAT, variable: 15-ohm, ±20%; 75-watt; type PR–75.	Filament voltage control.
R19	ABCD	3Z6001F6–2	RESISTOR: 16-ohm; 600-watt heater element; type 415–A.	Transformer T6 primary voltage dropping.
RY1	ABCD	2Z7590–88	RELAY: DPST; 117 v ac; type No. 21D056. Replaces GML type No. 251 (2Z7717).	Plate power ON-OFF.
RY3	ABCD	2Z7717.2	RELAY: DPDT; 117 v ac; type No. 400.	PHONE–CW switching.
SW1	ABCD	3Z9851	SWITCH: SPST; toggle; type P & S No. 1311.	Filament ON-OFF.
SW3	ABCD	3Z9851	SWITCH: SPST; toggle; type P & S No. 1311.	Exciter plate power ON-OFF.
SW4	ABCD	3Z9851	SWITCH: SPST; toggle; type P & S No. 1311.	High-voltage protection switch.
SW5	ABCD	3Z9812–2	SWITCH: SPST; interlock; type AH & H No. 3592D.	Xmtr rear-cover safety switch.
SW6	ABCD	3Z9851	SWITCH: SPST; toggle; type P & S No. 1311.	Xmtr plate power ON-OFF.
SW7	ABCD	3Z9854–14	SWITCH: 4-PDT; toggle; type C-H No. 8885K1.	SW-PHONE switching.
SW10	ABCD	3Z9811–7	SWITCH ASSEMBLY: SPST: interlock; 3-section; GE No. 7460330–GA.	Xmtr top-cover safety switch.
SW11	ABCD	3Z9812–2	SWITCH: SPST; interlock; type AH & H No. 3592D.	Final tank coil cover door safety switch.
SW11.1	ABCD	2C6500A/S1	SWITCH ASSEMBLY: 4-section; isolantite wafers.	Tube V8 cathode circuit switching.
SW11.2	ABCD	2C6500A/S1	Same as SW11.1	Tube V8 grid circuit switching.
SW11.3	ABCD	2C6500A/S1	Same as SW11.1	Tube V9 plate supply circuit switching.
SW11.4	ABCD	2C6500A/S1	Same as SW11.1	Tube V9 plate circuit switching.
SW11.5	ABCD	2C6500A/S1	Same as SW11.1	Tubes V10 and V11 plate circuit switching.
SW11.6	CD	2C6500A/S1	Same as SW11.1	Shorting switch.
SW12	ABCD	3Z79824–274	SWITCH: SPST; momentary push-button; Utahrad type No. PS-3.	Overload relay reset.
SW13	ABCD	3Z9812–2	SWITCH: SPST; interlock; type 3592D.	Tuning unit compartment switch.
SW16	D	3Z9812–2	SWITCH: SPST; interlock; type 3592D.	Final tank coil compartment switch.
TS1	ABCD	2Z9412	STRIP, terminal: 12-terminal; type 12–6.	Exciter chassis cable connections.
TS3	ABCD	2Z9408.1	BLOCK, terminal: 8-terminal; special; type 10–142.	H-v power supply chassis cable connections.
TS4	ABCD	2Z9402	STRIP, terminal: 2-terminal; standard; type 1720.	A-c outlet for relay RY4.
TS5	ABCD	2Z9402.1	STRIP, tip jack: 2-jack; standard; type 1490.	A-c outlet for cover interlocks.

Ref symbol	Model	Sig C stock No.	Name and description of part	Function
FS1, FS2	E	3Z2025	FUSE: plug; 25-amp; 125-v; type 5725.	Line fuse.
FS3	E	3Z2020	FUSE: plug; 20-amp; 125-v; type 5120.	Transformer T6, primary.
FS4	E	3Z2605.2	FUSE: 5-amp; 250-v; type 1358.	Protects T2, T3, T4, T5, RY1, RY2, RY3, RY4, and LM3.
FS5	E	3Z1950	FUSE: 3-amp; 250-v; type 1043.	Protects T1 and Speech Amplifier BC–614–( ) power supply primaries.
LM3	E	2Z5903	LAMP: 120-v; 6-watt.	Filament ON-OFF indicator.
LM4	E	2Z5903	LAMP. 120-v; 6-watt.	H-v power supply ON-OFF indicator.
PL1, PL2	E	2Z7116.22	PLUG: 6-contact; male; type P–406–LAB.	R-f section to mod chassis cable plug.
PL3	E	2Z7228.1	PLUG: 8-contact; male; type P–408–LAB.	Lower control panel to mod chassis cable plug.
PL4	E	2Z7116.22	PLUG: 6-contact; male; type P–406–LAB.	Lower control panel to mod chassis cable plug.
R12	E	2Z7261	POTENTIOMETER: wire-wound; 500-ohm; 50-watt; type PR–50.	Tubes V3 and V4 bias voltage control.
R18	E	3Z7015–14	RHEOSTAT: variable: 15-ohm, ±20%; 75-watt; IRC 15-ohm.	Filament voltage control.
R19	E	3Z6001F6–2	RESISTOR: wire-wound; 16-ohm; 600-watt heater element.	Transformer T6 primary voltage dropping.
RY1	E	2Z7590–88	RELAY: DPST; 117 v ac; type No. 210056. Replaces GML type 251 (227717).	Plate power ON-OFF.
RY3	E	2Z7717.2	RELAY: DPDT; 117 v ac; type 400.	CW-PHONE switching.
SO1, SO2	E	2Z8639	SOCKET: 6-contact; female; type S–406–AB.	Sockets on mod chassis for plugs PL1 and PL2.
SO3	E	2Z8678.43	SOCKET: 8-contact; female; type S–408–AB.	Socket on mod chassis for plug PL3.
SO4	E	2Z8639	SOCKET: 6-contact; female; type S–406–AB.	Socket on mod chassis for plug PL4.
SO5	E	2Z8678.13	SOCKET: 8-contact; female; Amphenol Type PO8F.	Speech amplr input connection on Radio Transmitter BC–610–E.
SO6	E	6Z7588	SOCKET: male; twist locktype; 20-amp; 250-v; type 8808.	110-v a-c power input connection on Radio Transmitter BC–610–E.
SO7	E	2Z8639–5	SOCKET: 12-terminal; female; bakelite; special.	Channel 1 tuning unit socket.
SO8	E	2Z8639–5	SOCKET: 12-terminal; female; bakelite; special.	Channel 2 tuning unit socket.
SO9	E	2Z8639–5	SOCKET: 12-terminal; female; bakelite; special.	Channel 3 tuning unit socket.
SW1	E	3Z9851	SWITCH: SPST; toggle; type P & S No. 1311.	Filament ON-OFF.
SW2	E	3Z9811–7	SWITCH: SPST; interlock; 3-section; GE No. 7460330–GA.	Coil unit compartment safety interlock switch.
SW3	E	3Z9861–1	SWITCH: DPST; bakelite; type P & S No. 1212.	Exciter plate power ON-OFF.
SW4	E	3Z9851	SWITCH: SPST; toggle; type P & S No. 1311.	High-voltage protection switch.
SW5	E	3Z9812–2	SWITCH: SPST; interlock; type AH & H No. 3592D.	Xmtr rear-cover safety switch.
SW6	E	3Z9851	SWITCH: SPST; toggle; type P & S No. 1311.	Xmtr plate power ON-OFF.
SW7	E	3Z9845–14	SWITCH: 4-PDT; toggle; type C-H No. 3885KI.	CW-PHONE switching.
SW10	E	3Z9811–7	SWITCH ASSEMBLY: SPST; interlock; 3-section; GE No. 7460330–GA.	Xmtr top cover safety switch.
SW11.1	E	2C6500A/S1	SWITCH ASSEMBLY: rotary; 4-section; 3-position; isolantite wafers.	Tube V8 grid circuit switching.
SW11.2	E	2C6500A/S1	Same as SW11.1.	Tube V8 cathode circuit switching.
SW11.3	E	2C6500A/S1	Same as SW11.1.	Tube V9 plate circuit switching.
SW11.4	E	2C6500A/S1	Same as SW11.1.	Tubes V10 and V11 plates circuit switching.
SW12	E	3Z79824–274	SWITCH: SPST; momentary push-button; Utah-rad type No. PS–3.	Overload relay reset.
SW13	E	3Z9811.7	SWITCH: SPST; interlock; type 7460330G4.	Tuning unit compartment switch.
TS1	E	2Z9412.27	STRIP, terminal: 12-terminal; special.	Exciter chassis cable connections.
TS3	E	2Z9408.1	BLOCK, terminal: 8-terminal; special.	H-v power supply chassis cable connections.
TS4	E	2Z9402	STRIP, terminal: standard 2-terminal; type 1720.	A-c outlet for relay RY4.
TS5	E	2Z9402.1	STRIP, tip jack; 2-jack; standard; type 1490.	A-c outlet for cover interlock.

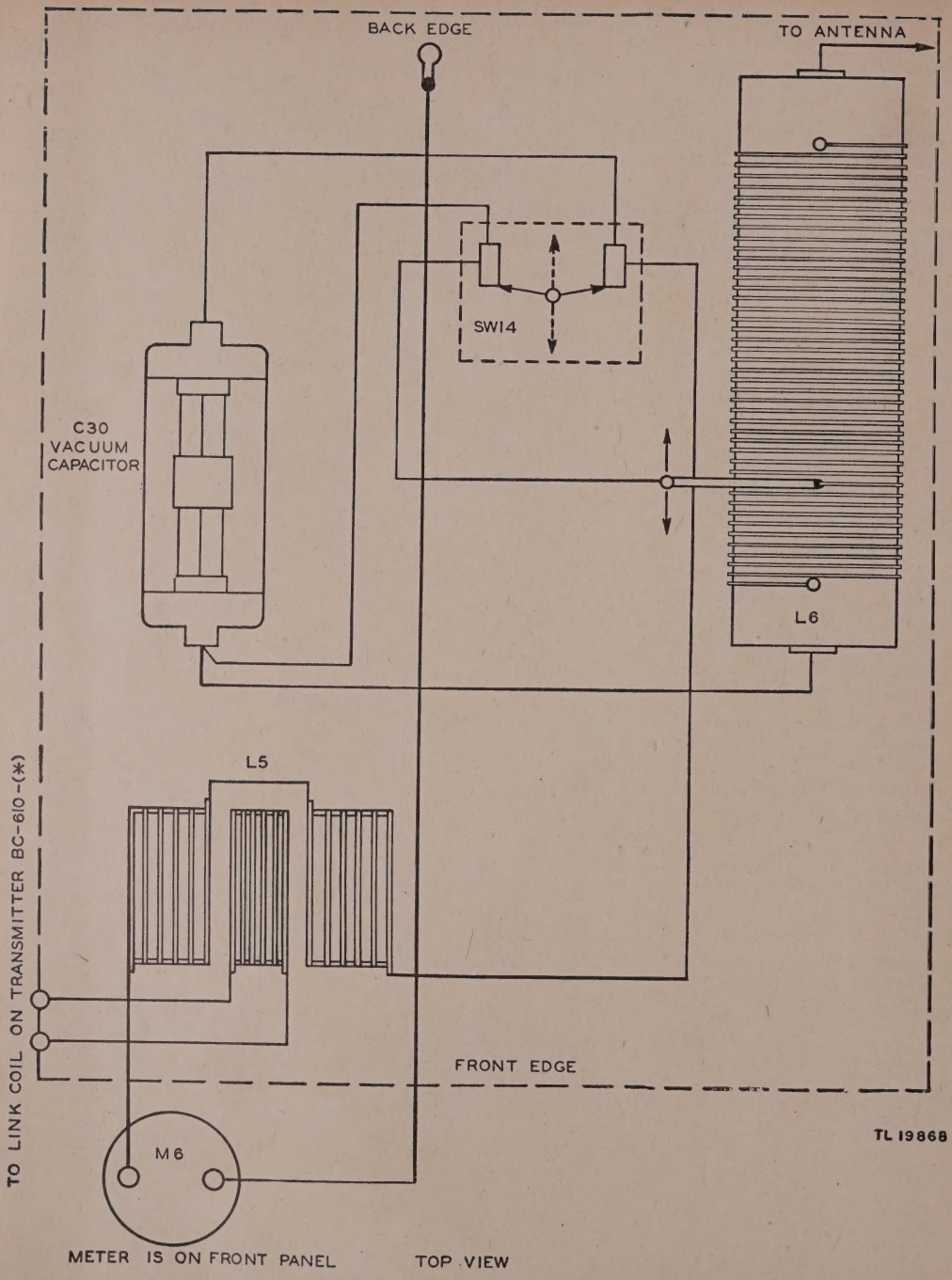


Figure 43. Antenna Tuning Unit BC-729-(*), practical wiring diagram.

SECTION IX
SUPPLEMENTARY DATA

40. Measuring Oscillator Frequency

a. Absorption Frequency Meter. As the first step in checking the oscillator frequency, use first the absorption frequency meter to determine the fundamental frequency and the proper order of harmonic.

b. Frequency Meter Set SCR–211–( ). To make a highly accurate determination of the operating frequency and frequency stability, as well as to check the quality of the generated r-f signal use Frequency Meter Set SCR–211–( ). Proceed as follows:

(1) The oscillator frequency of the transmitter at any of the dial settings may be checked by using Frequency Meter Set SCR–211–( ). See TM11–300, for detailed instructions. Recalibrate the instrument if necessary before using it. In order that the frequency meter may pick up an adequate signal from the transmitter, connect an antenna of 6 inches to 1 foot of #12 copper wire to the frequency meter. Plug the telephone headset which is part of the Frequency Meter Set SCR–211–( ) into the phone jack. Turn on the frequency meter and allow it to heat for 15 to 20 minutes so that its operation will be stable. Always adjust the CORRECTOR control before taking readings.

(2) Operate Frequency Meter Set SCR–211–( ) within the vicinity of the transmitter. Do not place it any closer to the transmitter than is necessary to secure an adequate signal in the headset. The amount of coupling between the frequency meter and the transmitter may be changed by varying the distance between the frequency meter and the transmitter.

(3) Consult the tuning charts (XIV through XXV) of Radio Transmitter BC–610–(*) for the approximate oscillator frequency. Find the approximate dial setting for the approximate transmitter oscillator frequency in the calibration book of the frequency meter.

(4) To measure the exact frequency of the transmitter adjust the main tuning dial of the frequency meter until the frequency of the beat note heard in the headset is reduced to zero cycles per second (zero beat); that is, until no signal is heard. In the calibration book find the setting of the frequency meter dial which corresponds with the zero signal heard in the headset. The frequency thus found is the *exact* oscillator frequency of the transmitter.

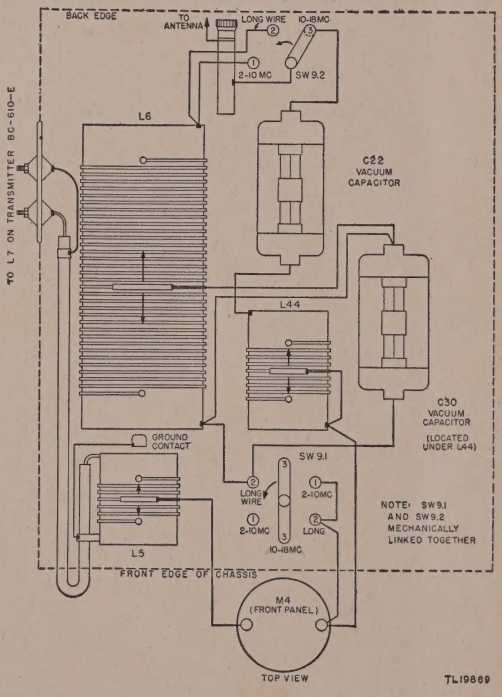


Figure 44. Antenna Tuning Unit BC–939–A, practical wiring diagram.

Table XI. Characteristics of Vacuum Tubes.

JAN number Sig C type No.	866/866-A (VT-46-A)	2A3 (VT-95)	807 (VT-100)	6V6GT (VT-107)	6L6 (VT-155)	OD3/VR-140 (VT-139)	5Z3 (VT-145)	100TH (VT-218)	250TH (VT-220)
A-c filament voltage	2.5	2.5	6.3	6.3	6.3	.....	5.0	5.0	5.0
A-c filament current (amp)	5.0	2.5	0.9	0.45	0.9	.....	3.0	6.5	10.5
D-c plate voltage	.....	300	600	300	375	150	.....	2000	2500
D-c screen voltage	.....	.....	250	150	300	.....	.....	.....	.....
D-c grid bias voltage	.....	62	-50	-25	-35	.....	.....	.....	-220
Max a-c voltage per plate	.....	.....	.....	.....	.....	.....	500	.....	.....
Max inverse peak voltage	10,000	.....	.....	.....	.....	.....	1400	.....	.....
D-c plate current (ma)	.....	40	100	35	88	.....	.....	225	290
D-c screen current (ma)	.....	.....	9.0	5	9	.....	.....	.....	.....
D-c grid current (ma)	.....	.....	3.0	3.0	3.5	.....	.....	.....	70
Max d-c output current (ma)	250	.....	.....	.....	.....	30	250	.....	.....
Plate dissipation (watts)	.....	.....	25	12	20	.....	.....	100	250
Approx grid driving power (watts)	.....	.....	0.22	.....	0.18	.....	.....	.....	42
Approx output power (watts)	.....	15	37.5	.....	17	.....	.....	380	600
Plate resistance (ohms)	.....	800	.....	.....	.....	.....	.....	.....	.....
Transconductance (micro-ohms)	.....	5250	.....	.....	.....	.....	.....	30	32
Amplification factor	.....	4.2	.....	.....	.....	.....	.....	16,000	.....
Load resistance (ohms)	.....	3000	.....	.....	.....	.....	.....	.....	.....

Table XII. Tuning Chart of Radio Transmitter BC-610-A, BC-610-B, BC-610-C, and BC-610-D for Tuning Box TU-47 (Frequency Range 2.0-2.5 MC.).

NOTE: Use Vacuum Condenser CA-423.

APPROXIMATE DIAL SETTINGS

Operating frequency in KC	Crystal frequency (If used)	Coil unit	Tuning controls				
			M.O.	Doub.	Int. amp.	Plate tuning	Antenna tuning
2000	2000	C-387	10	0.5	2.0	10	8.8
2050	2050	C-387	21	1.0	2.25	21	10.0
2100	2100	C-387	30	1.5	2.50	30	12.0
2150	2150	C-387	40	2.0	3.0	40	14.0
2200	2200	C-387	47	2.5	3.5	47	16.0
2250	2250	C-387	54	3.0	5.0	52	18.1
2300	2300	C-387	60	4.0	6.0	60	19.0
2350	2350	C-387	67	5.0	6.5	67	21.0
2400	2400	C-387	73	5.5	7.0	73	22.5
2450	2450	C-387	80	6.0	7.5	79	24.0
2500	2500	C-387	86	6.5	8.0	86	25.5

Note: For exact M.O. setting, use Frequency Meter Set SCR-211-( ).

Table XIII. Tuning Chart of Radio Transmitter BC-610-A, BC-610-B, BC-610-C, and BC-610-D for Tuning Box TU-48 (Frequency Range 2.5-3.2 MC.)

APPROXIMATE DIAL SETTINGS

Operating frequency in KC	Crystal frequency (If used)	Coil unit	Tuning controls				
			M.O.	Doub.	Int. Amp.	Plate tuning	Antenna tuning
2500	2500	C-387	15	3	5	10	27.3
2550	2550	C-387	23	3.5	5.25	15	28.5
2600	2600	C-387	31	4.0	5.5	18	29.3
2650	2650	C-387	36	4.25	6.0	22	30.0
2700	2700	C-387	42	4.5	6.25	26	31.0
2750	2750	C-387	47	5.5	6.5	30	31.8
2800	2800	C-387	53	6.0	7.0	35	33.2
2850	2850	C-387	58	6.25	7.25	38	33.8
2900	2900	C-387	64	6.5	7.75	42	34.0
2950	2950	C-387	69	7.0	8.0	46	35.0
3000	3000	C-887	75	7.5	8.5	50	36.0
3050	3050	C-387	80	8.0	8.75	54	36.7
3100	3100	C-387	86	8.5	9.25	58	37.4
3150	3150	C-387	91	8.75	9.5	62	38.2
3200	3200	C-387	97	9.0	10.0	63	39.3

Note: For exact M.O. setting, use Frequency Meter Set SCR-211-( ).

Table XIV. Tuning Chart of Radio Transmitter BC–610–A, BC–610–B, BC–610–C, and BC–610–D, for Tuning Box TU–49. (Frequency Range 3.2–4.0MC.)

APPROXIMATE DIAL SETTINGS

Operating frequency in KC	Crystal frequency (If used)	Coil unit	Tuning controls				
			M.O.	Doub.	Int. amp.	Plate tuning	Antenna tuning
3200	3200	C–387	26	1.5	1.5	63	39.3
3250	3250	C–387	31	2.0	2.0	65	39.4
3300	3300	C–387	37	2.5	2.5	68	39.6
3350	3350	C–387	42	3.0	3.0	70	39.7
3400	3400	C–387	47	3.5	3.5	73	39.8
3450	3450	C–388	52	4.0	4.0	22	40.4
3500	3500	C–388	56	4.5	5.0	25	40.8
3550	3550	C–388	60	5.0	5.5	28	41.2
3600	3600	C–388	64	5.25	5.75	31	41.7
3650	3650	C–388	69	5.5	6.0	35	42.2
3700	3700	C–388	73	6.0	6.5	38	42.8
3750	3750	C–388	76	6.25	6.75	40	43.1
3800	3800	C–388	80	6.5	7.0	43	43.4
3850	3850	C–388	83	7.0	7.5	46	43.9
3900	3900	C–388	86	7.5	8.0	48	44.3
3950	3950	C–388	90	8.0	8.5	51	44.7
4000	4000	C–388	95	8.5	9.0	53	45

Note: For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

Table XV. Tuning Chart of Radio Transmitter BC–610–A, BC–610–B, BC–610–C, and BC–610–D, for Tuning Box TU–50. (Frequency Range 4.0–5.0 MC.)

APPROXIMATE DIAL SETTINGS

Operating frequency in KC	Crystal frequency (If used)	Coil unit	Tuning controls				
			M.O.	Doub.	Int. Amp.	Plate tuning	Antenna tuning
4000	2000	C–388	3	1.0	2.5	53	45
4050	2025	C–388	11	2.0	3.0	55	45.8
4100	2050	C–388	18	2.5	3.5	58	46.2
4150	2075	C–388	23	2.75	4.0	60	46.8
4200	2100	C–388	28	3.0	4.75	63	47.0
4250	2125	C–388	33	3.25	5.0	65	47.9
4300	2150	C–388	37	3.5	5.5	68	48.1
4350	2175	C–388	42	4.0	6.0	70	48.3
4400	2200	C–389	46	4.25	6.25	12	48.8
4450	2225	C–389	50	4.5	6.5	15	49.0
4500	2250	C–389	53	4.75	6.75	18	49.2
4550	2275	C–389	57	5.0	7.0	20	49.5
4600	2300	C–389	61	5.5	7.25	23	49.8
4650	2325	C–389	65	5.75	7.5	25	50.0
4700	2350	C–389	69	6.0	7.75	28	50.2
4750	2375	C–389	73	6.25	7.8	31	50.5
4800	2400	C–389	76	6.5	8.0	34	51.0
4850	2425	C–389	80	6.75	8.25	36	51.2
4900	2450	C–389	83	7.0	8.5	39	51.5
4950	2475	C–389	86	7.5	8.75	42	52.0
5000	2500	C–389	88	8.0	9.0	44	52.4

Note: For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

Table XVI. Tuning Chart of Radio Transmitter BC–610–A, BC–610–B, BC–610–C, and BC–610–D, for Tuning Box TU–51. (Frequency range 5.0–6.35MC.)

APPROXIMATE DIAL SETTINGS

Operating frequency in KC	Crystal frequency (If used)	Coil unit	Tuning controls				
			M.O.	Doub.	Int. Amp.	Plate tuning	Antenna tuning
5000	2500	C–389	9	3.0	3.0	44	52.4
5050	2525	C–389	13	3.0	3.0	46	52.6
5100	2550	C–389	18	4.0	4.0	48	52.9

Note: For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

Table XVI. Tuning Chart of Radio Transmitter BC–610–A, BC–610–B, BC–610–C, and BC–610–D, for Tuning Box TU–51. (Frequency range 5.0–6.35 MC.)—Continued

APPROXIMATE DIAL SETTINGS

Operating frequency in KC	Crystal frequency (If used)	Coil unit	Tuning controls				
			M.O.	Doub.	Int. amp.	Plate tuning	Antenna tuning
5150	2575	C–389	22	4.0	4.0	50	53.1
5200	2600	C–389	26	4.0	4.0	52	53.4
5250	2625	C–389	29	5.0	5.0	54	53.6
5300	2650	C–389	33	5.0	5.0	56	53.8
5350	2675	C–389	37	5.0	5.0	57	54.1
5400	2700	C–389	40	5.5	5.5	59	54.3
5450	2725	C–389	43	5.5	5.5	61	54.5
5500	2750	C–389	47	5.5	5.5	63	54.8
5550	2775	C–389	50	6.0	6.0	65	55.0
5600	2800	C–389	54	6.0	6.0	67	55.3
5650	2825	C–389	57	6.0	6.0	69	55.5
5700	2850	C–389	60	7.0	7.0	70	55.7
5750	2875	C–390	63	7.0	7.0	14	56.0
5800	2900	C–390	65	7.0	7.0	16	56.2
5850	2925	C–390	68	7.0	7.0	18	56.4
5900	2950	C–390	70	7.5	7.5	20	56.7
5950	2975	C–390	73	7.5	7.5	21	57.0
6000	3000	C–390	75	7.5	7.6	23	47.5
6100	3050	C–390	80	7.5	7.5	27	47.9
6200	3100	C–390	84	7.5	7.5	31	48.3
6300	3150	C–390	89	8.0	8.0	35	48.8
6350	3175	C–390	92	8.0	8.0	37	49.0

Note. For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

Table XVII. Tuning Chart of Radio Transmitter BC–610–A, BC–610–B, BC–610–C, and BC–610–D, for Tuning Box TU–52. (Frequency range 6.35–8.0 MC.)

APPROXIMATE DIAL SETTINGS

Operating frequency in KC	Crystal frequency (If used)	Coil unit	Tuning controls				
			M.O.	Doub.	Int. Amp.	Plate tuning	Antenna tuning
6350	3175	C–390	3	3.5	4.0	37	49.0
6400	3200	C–390	8	4.0	4.5	40	49.2
6500	3250	C–390	16	4.5	5.0	44	49.6
6600	3300	C–390	23	5.0	6.0	46	49.9
6700	3350	C–390	29	5.0	6.0	49	50.3
6800	3400	C–390	35	5.0	6.0	52	50.6
6900	3450	C–390	41	6.5	7.0	56	51.0
7000	3500	C–390	46	6.5	7.0	58	51.3
7100	3550	C–390	52	6.5	7.0	62	51.6
7200	3600	C–390	56	7.0	7.5	65	51.9
7300	3650	C–390	61	7.5	8.0	66	52.2
7400	3700	C–390	65	7.5	8.0	68	52.5
7500	3750	C–390	70	7.5	8.0	70	52.8
7600	3800	C–390	75	8.0	8.5	72	53.1
7700	3850	C–390	79	8.0	8.5	75	53.3
7800	3900	C–390	84	8.0	8.5	77	53.6
7900	3950	C–390	89	8.5	9.0	79	53.9
8000	4000	C–390	95	9.0	9.0	80	54.2

Note. For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

Table XVIII. Tuning Chart of Radio Transmitter BC–610–E for Tuning Unit TU–47. (Frequency range 2.0–2.5 MC.)

Note. Use V.C. 50 on 2-2.5 MC.

APPROXIMATE DIAL SETTINGS

Operating frequency in kilocycles	Crystal frequency if used	Coil unit	Tuning controls			P.A. plate tuning	Antenna tuning unit BC–939–A		
			M.O.	Doub.	Int. amp.		Band switch position	Coupling	Loading
2000	2000	C–387–B	11	2.4	4.7	16	2–10	2.8	9.2
2050	2050	C–387–B	22	3.2	5.2	25	2–10	2.8	11.5
2100	2100	C–387–B	32	3.8	5.5	34	2–10	2.8	13.5
2150	2150	C–387–B	41	4.3	5.9	42	2–10	2.8	15.6
2200	2200	C–387–B	49	4.8	6.3	51	2–10	2.8	17.4
2250	2250	C–387–B	57	5.2	6.7	58	2–10	2.8	19.0
2300	2300	C–387–B	63	5.6	7.0	65	2–10	2.8	20.4
2350	2350	C–387–B	69	6.0	7.4	72	2–10	2.8	21.8
2400	2400	C–387–B	75	6.3	7.7	77	2–10	2.8	23.1
2450	2450	C–387–B	81	6.7	8.0	83	2–10	2.8	24.4
2500	2500	C–387–B	85	7.0	8.2	89	2–10	2.8	25.5

Note. For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

Table XIX. Tuning Chart of Radio Transmitter BC–610–E for Tuning Unit TU–48. (Frequency range 2.5–3.2 MC.)

APPROXIMATE DIAL SETTINGS

Operating frequency in kilocycles	Crystal frequency if used	Coil unit	Tuning controls			P.A. plate tuning	Antenna tuning unit BC–939–A		
			M.O.	Doub.	Int. amp.		Band switch position	Coupling	Loading
2500	2500	C–387–B	10	0.7	2.8	7	2–10	2.4	25.7
2550	2550	C–387–B	18	1.7	3.4	11	2–10	2.4	27.0
2600	2600	C–387–B	26	2.4	3.9	16	2–10	2.4	28.0
2650	2650	C–387–B	33	3.1	4.4	20	2–10	2.4	29.0
2700	2700	C–387–B	40	3.7	4.9	25	2–10	2.4	30.0
2750	2750	C–387–B	46	4.1	5.3	27	2–10	2.4	30.9
2800	2800	C–387–B	52	4.5	5.8	32	2–10	2.5	31.8
2850	2850	C–387–B	58	4.9	6.1	35	2–10	2.5	32.6
2900	2900	C–387–B	63	5.2	6.5	39	2–10	2.5	33.4
2950	2950	C–387–B	68	5.6	6.8	41	2–10	2.5	34.1
3000	3000	C–387–B	73	5.9	7.2	45	2–10	2.5	34.8
3050	3050	C–387–B	78	6.1	7.4	49	2–10	2.5	35.5
3100	3100	C–387–B	82	6.4	7.7	52	2–10	2.5	36.1
3150	3150	C–387–B	87	6.6	7.9	54	2–10	2.5	36.8
3200	3200	C–387–B	90	6.8	8.0	57	2–10	2.5	37.4

Note. For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

Table XX. Tuning Chart of Radio Transmitter BC–610–E for Tuning Unit TU–49. (Frequency range 3.2–4.0MC.)

APPROXIMATE DIAL SETTINGS

Operating frequency in kilocycles	Crystal frequency if used	Coil unit	Tuning controls			P.A. plate tuning	Antenna tuning unit BC–939–A		
			M.O.	Doub.	Int. amp.		Band switch position	Coupling	Loading
3200	3200	C–387–B	25	3.4	5.8	57	2–10	2.7	37.4
3250	3250	C–387–B	30	3.8	6.1	60	2–10	2.7	37.8
3300	3300	C–387–B	35	4.2	6.3	62	2–10	2.6	38.3
3350	3350	C–387–B	40	4.6	6.5	64	2–10	2.6	38.8
3400	3400	C–387–B	45	4.9	6.7	66	2–10	2.5	39.3
3450	3450	C–387–B	50	5.3	6.9	68	2–10	2.4	39.8
3500	3500	C–387–B	55	5.6	7.1	70	2–10	2.4	40.3
3500	3500	C–388–A	55	5.6	7.1	14	2–10	1.7	40.3
3550	3550	C–388–A	59	5.9	7.3	17	2–10	1.7	40.7
3600	3600	C–388–A	64	6.1	7.5	20	2–10	1.7	41.1
3650	3650	C–388–A	68	6.4	7.7	23	2–10	1.7	41.5
3700	3700	C–388–A	72	6.6	7.9	26	2–10	1.7	41.9

Note. For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

Table XX. Tuning Chart of Radio Transmitter BC–610–E for Tuning Unit TU–49 (Frequency range 3.2–4.0 MC.) —Continued

APPROXIMATE DIAL SETTINGS

Operating frequency in kilocycles	Crystal frequency if used	Coil unit	Tuning controls			P.A. plate tuning	Antenna tuning unit BC–939–A		
			M.O.	Doub.	Int. amp.		Band switch position	Coupling	Loading
3750	3750	C–388–A	75	6.8	8.1	29	2–10	1.7	42.3
3800	3800	C–388–A	79	7.0	8.3	32	2–10	1.7	42.7
3850	3850	C–388–A	82	7.2	8.5	34	2–10	1.7	43.1
3900	3900	C–388–A	85	7.4	8.7	37	2–10	1.7	43.4
3950	3950	C–388–A	88	7.6	8.8	40	2–10	1.7	43.8
4000	4000	C–388–A	91	7.8	8.9	42	2–10	1.7	44.2

Note. For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

Table XXI. Tuning Chart of Radio Transmitter BC–610–E for Tuning Unit TU–50. (Frequency range 4.0–5.0 MC.)

APPROXIMATE DIAL SETTINGS

Operating frequency in kilocycles	Crystal frequency if used	Coil unit	Tuning controls			P.A. plate tuning	Antenna tuning unit BC–939–A		
			M.O.	Doub.	Int. amp.		Band switch position	Coupling	Loading
4000	2000	C–388–A	7	2.2	3.5	42	2–10	1.8	44.2
4050	2025	C–388–A	13	2.5	3.9	44	2–10	1.8	44.5
4100	2050	C–388–A	19	2.9	4.3	47	2–10	1.8	44.8
4150	2075	C–388–A	24	3.2	4.6	49	2–10	1.8	45.2
4200	2100	C–388–A	29	3.5	5.0	52	2–10	1.8	45.4
4250	2125	C–388–A	34	3.8	5.3	54	2–10	1.8	45.7
4300	2150	C–388–A	39	4.1	5.6	55	2–10	1.8	46.0
4350	2175	C–388–A	44	4.4	5.9	57	2–10	1.8	46.3
4400	2200	C–388–A	48	4.6	6.1	59	2–10	1.8	46.5
4450	2225	C–388–A	52	4.8	6.4	61	2–10	1.8	46.7
4500	2250	C–388–A	56	5.1	6.6	63	2–10	1.8	47.0
4500	2250	C–389–A	56	5.1	6.6	17	2–10	1.8	47.1
4550	2275	C–389–A	60	5.3	6.8	19	2–10	1.8	47.3
4600	2300	C–389–A	64	5.6	7.0	21	2–10	1.8	47.5
4650	2325	C–389–A	67	5.8	7.2	24	2–10	1.8	47.7
4700	2350	C–389–A	71	6.0	7.3	26	2–10	1.8	47.9
4750	2375	C–389–A	74	6.2	7.5	28	2–10	1.8	48.2
4800	2400	C–389–A	78	6.4	7.7	30	2–10	1.8	48.3
4850	2425	C–389–A	81	6.6	7.8	32	2–10	1.8	48.5
4900	2450	C–389–A	84	6.8	8.0	34	2–10	1.8	48.7
4950	2475	C–389–A	88	7.0	8.2	37	2–10	1.8	48.9
5000	2500	C–389–A	91	7.1	8.4	39	2–10	1.8	49.1

Note. For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

Table XXII. Tuning Chart of Radio Transmitter BC–610–E for Tuning Unit TU–51. (Frequency range 5–6.35 MC.)

APPROXIMATE DIAL SETTINGS

Operating frequency in kilocycles	Crystal frequency if used	Coil unit	Tuning controls			P.A. plate tuning	Antenna tuning unit BC–939–A		
			M.O.	Doub.	Int. amp.		Band switch position	Coupling	Loading
5000	2500	C–389–A	5	2.5	4.0	39	2–10	1.8	49.1
5050	2525	C–389–A	10	2.8	4.3	41	2–10	1.8	49.3
5100	2550	C–389–A	15	3.1	4.6	43	2–10	1.8	49.5
5150	2575	C–389–A	19	3.4	4.8	45	2–10	1.9	49.7
5200	2600	C–389–A	23	3.7	5.1	46	2–10	1.9	49.8
5250	2625	C–389–A	27	3.9	5.3	48	2–10	1.9	50.0
5300	2650	C–389–A	31	4.2	5.6	50	2–10	1.9	50.2
5350	2675	C–389–A	34	4.4	5.8	52	2–10	1.9	50.4

Table XXII. Tuning Chart of Radio Transmitter BC–610–E for Tuning Unit TU–51. (Frequency range 5–6.35 MC.) (Continued)

APPROXIMATE DIAL SETTINGS

Operating frequency in kilocycles	Crystal frequency if used	Coil unit	Tuning controls			P.A. plate tuning	Antenna tuning unit BC–939–A		
			M.O.	Doub.	Int. amp.		Band switch position	Coupling	Loading
5400	2700	C–389–A	38	4.6	6.0	53.5	2–10	1.9	50.6
5450	2725	C–389–A	41	4.8	6.2	55	2–10	1.9	50.7
5500	2750	C–389–A	44	5.0	6.4	56	2–10	1.9	50.9
5550	2775	C–389–A	48	5.2	6.6	57.5	2–10	1.9	51.1
5600	2800	C–389–A	51	5.4	6.7	59	2–10	1.9	51.2
5650	2825	C–389–A	55	5.5	6.9	61	2–10	1.9	51.4
5700	2850	C–389–A	58	5.7	7.1	62	2–10	1.9	51.6
5700	2850	C–390–A	58	5.7	7.1	23	2–10	1.9	51.4
5750	2875	C–390–A	61	5.9	7.2	25	2–10	1.9	51.5
5800	2900	C–390–A	64	6.1	7.4	26	2–10	1.9	51.6
5850	2925	C–390–A	66	6.2	7.5	28	2–10	1.8	51.8
5900	2950	C–390–A	69	6.4	7.7	30	2–10	1.8	51.9
5950	2975	C–390–A	72	6.5	7.8	32	2–10	1.7	52.0
6000	3000	C–390–A	74	6.7	8.0	33.5	2–10	1.6	52.1
6050	3025	C–390–A	77	6.8	8.1	35	2–10	1.6	52.2
6100	3050	C–390–A	79	7.0	8.2	37	2–10	1.6	52.3
6150	3075	C–390–A	82	7.1	8.4	38.5	2–10	1.6	52.5
6200	3100	C–390–A	84	7.2	8.5	40	2–10	1.6	52.6
6250	3125	C–390–A	87	7.3	8.7	42	2–10	1.6	52.7
6300	3150	C–390–A	89	7.5	8.8	43.5	2–10	1.6	52.8
6350	3175	C–390–A	90	7.5	8.9	45	2–10	1.6	52.9

Note. For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

Table XXIII. Tuning Chart of Radio Transmitter BC–610–E for Tuning Unit TU–52. (Frequency Range 6.35–8.0 MC.)

APPROXIMATE DIAL SETTINGS

Operating frequency in kilocycles	Crystal frequency if used	Coil unit	Tuning controls			P.A. plate tuning	Antenna tuning unit BC–9 39–A		
			M.O.	Doub.	Int. amp.		Band switch position	Coupling	Loading
6350	3175	C–390–A	8	4.4	2.8	45	2–10	1.5	52.9
6400	3200	C–390–A	10	4.6	3.3	46	2–10	1.5	53.0
6500	3250	C–390–A	17	5.0	3.8	49	2–10	1.5	53.2
6600	3300	C–390–A	23	5.4	4.2	52	2–10	1.4	53.4
6700	3350	C–390–A	29	5.8	4.7	54	2–10	1.4	53.6
6800	3400	C–390–A	35	6.1	5.1	57	2–10	1.3	53.8
6900	3450	C–390–A	41	6.4	5.6	59	2–10	1.3	54.0
7000	3500	C–390–A	47	6.6	6.0	62	2–10	1.3	54.2
7100	3550	C–390–A	52	6.9	6.4	64	2–10	1.2	54.4
7200	3600	C–390–A	57	7.1	6.8	66	2–10	1.2	54.5
7300	3650	C–390–A	62	7.3	7.1	68	2–10	1.2	54.7
7400	3700	C–390–A	67	7.5	7.4	69.5	2–10	1.1	54.9
7500	3750	C–390–A	71	7.7	7.7	71	2–10	1.1	55.1
7600	3800	C–390–A	75	7.9	8.0	73	2–10	1.1	55.2
7700	3850	C–390–A	79	8.1	8.2	74	2–10	1.1	55.4
7800	3900	C–390–A	83	8.3	8.4	76	2–10	1.0	55.5
7900	3950	C–390–A	87	8.4	8.6	78	2–10	1.0	55.7
8000	4000	C–390–A	91	8.5	8.8	80	2–10	1.0	55.8

Note. For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

Table XXIV. Tuning Chart of Radio Transmitter BC–610–E for Tuning Unit TU–53. (Frequency range 8.0–12.0 MC.)

APPROXIMATE DIAL SETTINGS

Operating frequency in kilocycles	Crystal frequency if used	Coil unit	Tuning controls			P.A. plate tuning	Antenna tuning unit BC–939–A		
			M.O.	Doub.	Int. amp.		Band switch position	Coupling	Loading
8000	4000	C–447	6	1.5	1.5	21	2–10	1.0	55.7
8100	4050	C–447	9	1.8	1.8	24	2–10	0.9	55.8
8200	4100	C–447	13	2.0	2.0	26.5	2–10	0.9	56.0
8300	4150	C–447	16	2.3	2.3	29	2–10	0.8	56.2
8400	4200	C–447	19	2.6	2.6	32	2–10	0.8	56.3
8500	4250	C–447	23	2.8	2.8	34	2–10	0.8	56.4
8600	4300	C–447	26	3.1	3.1	36	2–10	0.8	56.6
8700	4350	C–447	29	3.3	3.3	39	2–10	0.8	56.8
8800	4400	C–447	32	3.6	3.6	41	2–10	0.8	56.9
8900	4450	C–447	35	3.8	3.8	43	2–10	0.9	57.1
9000	4500	C–447	38	4.0	4.0	45.5	2–10	0.9	57.2
9100	4550	C–447	41	4.2	4.2	48	2–10	1.0	57.3
9200	4600	C–447	43	4.3	4.3	49.5	2–10	1.0	57.5
9300	4650	C–447	46	4.5	4.5	51	2–10	1.0	57.6
9400	4700	C–447	49	4.7	4.7	53.5	2–10	1.1	57.7
9500	4750	C–447	51	5.9	4.9	55	2–10	1.1	57.8
9600	4800	C–447	53	5.1	5.1	57	2–10	1.1	58.0
9700	4850	C–447	55	5.3	5.3	58.5	2–10	1.1	58.1
9800	4900	C–447	57	5.4	5.4	60	2–10	1.1	58.2
9900	4950	C–447	59	5.6	5.6	62	2–10	1.1	58.4
10,000	5000	C–447	61	5.7	5.7	63.5	2–10	1.1	58.5
10,000	5000	C–447	61	5.7	5.7	63.5	10–18	1.1	*2.5
10,100	5050	C–447	63	5.8	5.8	65	10–18	1.1	*2.9
10,200	5100	C–447	65	6.0	6.0	66	10–18	1.1	*3.1
10,300	5150	C–447	67	6.2	6.2	68	10–18	1.1	*3.4
10,400	5200	C–447	68	6.3	6.3	69	10–18	1.1	*3.8
10,500	5250	C–447	70	6.4	6.4	70	10–18	1.1	*4.0
10,600	5300	C–447	72	6.6	6.6	71.5	10–18	1.1	*4.3
10,700	5350	C–447	73	6.7	6.7	73	10–18	1.1	*4.7
10,800	5400	C–447	75	6.8	6.8	74	10–18	1.1	*5.0
10,900	5450	C–447	76	7.0	7.0	75	10–18	1.1	*5.3
11,000	5500	C–447	78	7.1	7.1	76	10–18	1.1	*5.6
11,000	5500	C–448	78	7.1	7.2	40	10–18	1.5	*5.5
11,100	5550	C–448	79	7.2	7.2	42	10–18	1.5	*5.9
11,200	5600	C–448	81	7.3	7.3	44	10–18	1.5	*6.3
11,300	5650	C–448	82	7.4	7.4	45	10–18	1.5	*6.6
11,400	5700	C–448	83	7.5	7.5	46.5	10–18	1.5	*6.8
11,500	5750	C–448	84	7.6	7.6	48	10–18	1.5	*7.0
11,600	5800	C–448	85	7.7	7.7	50	10–18	1.5	*7.3
11,700	5850	C–448	86	7.8	7.8	51.5	10–18	1.5	*7.5
11,800	5900	C–448	87	7.9	7.9	53	10–18	1.5	*7.8
11,900	5950	C–448	88	8.0	8.0	54	10–18	1.5	*8.1
12,000	6000	C–448	90	8.1	8.1	56	10–18	1.5	*8.3

Note. For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

*Set L.F. Loading Coil at 30.

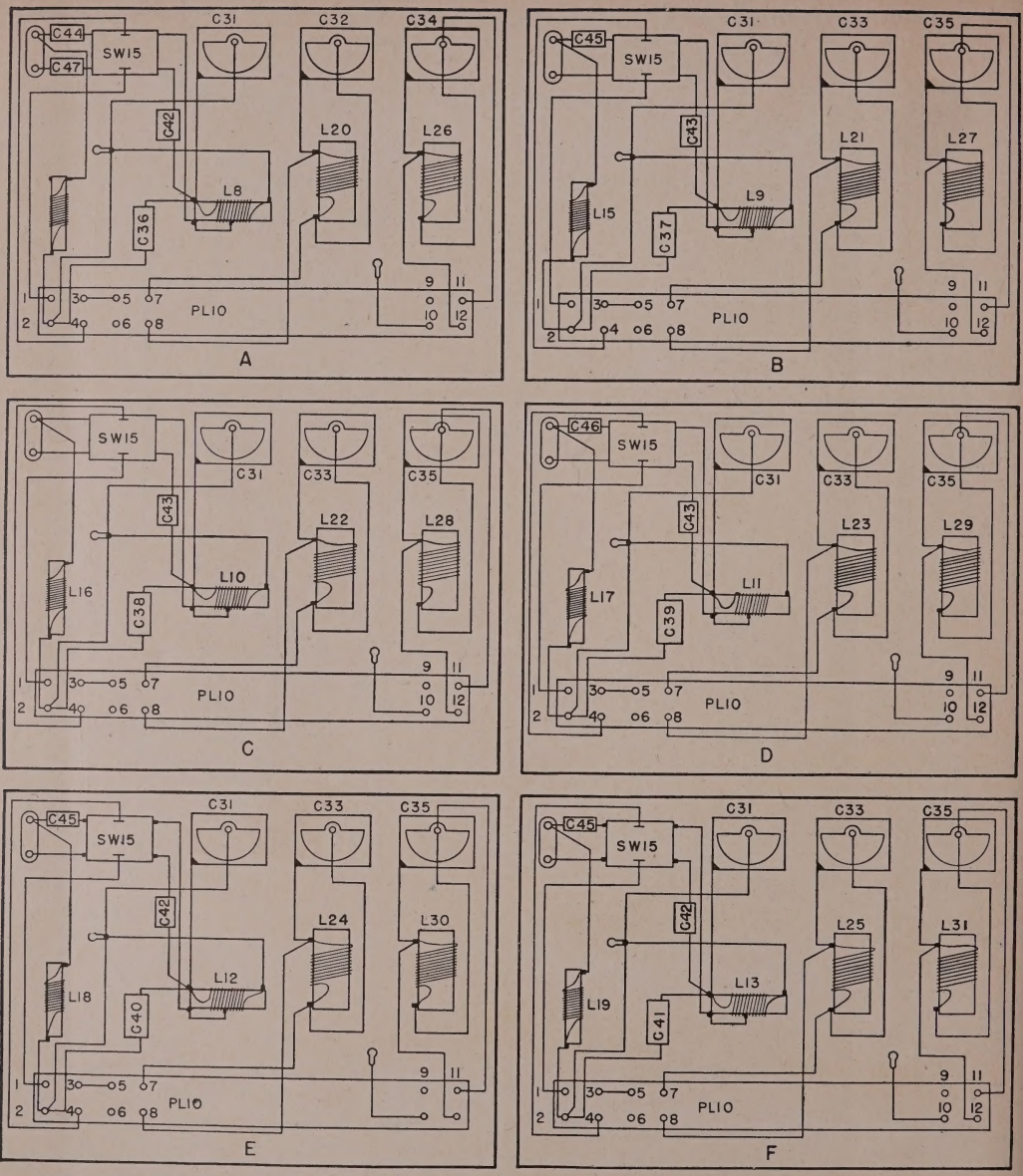
Table XXV. Tuning Chart of Radio Transmitter BC–610–E for Tuning Unit TU-54. (Frequency range 12–18 MC.)

APPROXIMATE DIAL SETTINGS

Operating frequency in kilocycles	Crystal frequency if used	Coil unit	Tuning controls			P.A. plate tuning	Antenna tuning unit BC–939–A		
			M.O.	Doub.	Int. amp.		Band switch position	Coupling	Loading
12,000	3000	C–448	6	.3	1.1	56	10–18	1.4	*8.3
12,100	3025	C–448	9	.4	1.4	57	10–18	1.4	*8.6
12,200	3050	C–448	12	.6	1.6	58	10–18	1.4	*8.8
12,300	3075	C–448	14	.8	1.8	60	10–18	1.4	*9.0
12,400	3100	C–448	17	1.0	2.1	61	10–18	1.4	*9.2
12,500	3125	C–448	19	1.2	2.3	62	10–18	1.4	*9.4
12,600	3150	C–448	21	1.4	2.5	64	10–18	1.4	*9.6
12,700	3175	C–448	23	1.5	2.7	65	10–18	1.4	*9.8
12,800	3200	C–448	25	1.7	2.9	66	10–18	1.3	*10.0
12,900	3225	C–448	27	1.8	3.1	67	10–18	1.3	*10.2
13,000	3250	C–448	29	1.9	3.2	68	10–18	1.3	*10.4
13,100	3275	C–448	31	2.1	3.3	69	10–18	1.3	*10.6
13,200	3300	C–448	33	2.2	3.5	70	10–18	1.3	*10.7
13,300	3325	C–448	35	2.4	3.7	71	10–18	1.3	*10.9
13,400	3350	C–448	37	2.5	3.8	72	10–18	1.3	*11.0
13,500	3375	C–448	38	2.6	4.0	73	10–18	1.3	*11.2
13,600	3400	C–448	40	2.7	4.1	74	10–18	1.3	*11.4
13,700	3425	C–448	41	2.8	2.3	74.5	10–18	1.3	*11.5
13,800	3450	C–448	43	3.0	4.4	75	10–18	1.3	*11.6
13,900	3475	C–448	45	3.1	4.5	76	10–18	1.3	*11.7
14,000	3500	C–448	46	3.2	4.6	77	10–18	1.3	*11.8
14,000	3500	C–449	46	3.2	4.6	29	10–18	0.8	*11.6
14,200	3550	C–449	49	3.4	4.8	32	10–18	0.8	*12.0
14,400	3600	C–449	52	3.6	5.1	35	10–18	0.8	*12.4
14,600	3650	C–449	55	3.8	5.3	37	10–18	0.8	*12.7
14,800	3700	C–449	58	3.9	5.5	40	10–18	0.8	*13.1
15,000	3750	C–449	61	4.1	5.7	43	10–18	0.8	*13.4
15,200	3800	C–449	63	4.3	5.8	45	10–18	0.8	*13.7
15,400	3850	C–449	65	4.5	6.1	48	10–18	0.8	*14.0
15,600	3900	C–449	68	4.7	6.2	50	10–18	0.8	*14.3
15,800	3950	C–449	70	4.8	6.4	52	10–18	0.8	*14.6
16,000	4000	C–499	72	5.0	6.6	54	10–18	0.8	*14.9
16,200	4050	C–449	74	5.2	6.7	56	10–18	0.8	*15.3
16,400	4100	C–449	76	5.3	6.8	58	10–18	0.8	*15.7
16,600	4150	C–449	78	5.5	6.9	60	10–18	0.8	*16.0
16,800	4200	C–449	80	5.6	7.1	62	10–18	0.8	*16.3
17,000	4250	C–449	82	5.7	7.2	64	10–18	0.8	*16.6
17,200	4300	C–449	84	5.8	7.4	66	10–18	0.8	*16.9
17,400	4350	C–449	85	5.9	7.5	67.5	10–18	0.8	*17.3
17,600	4400	C–449	87	6.1	7.7	69	10–18	0.8	*17.7
17,800	4450	C–449	89	6.2	7.9	70	10–18	0.8	*18.2
18,000	4500	C–449	91	6.3	8.1	72	10–18	0.8	*18.7

Note. For exact M.O. setting, use Frequency Meter Set SCR–211–( ).

*Set L.F. Loading Coil at 30.



INTERNAL VIEWS OF TUNING BOXES

A - TUNING UNIT TU-47, 2.0 TO 2.5 MC. PART NO. 51A442.

B - TUNING UNIT TU-48, 2.5 TO 3.2 MC. PART NO. 51A443.

C - TUNING UNIT TU-49, 3.2 TO 4.0 MC. PART NO. 51A444.

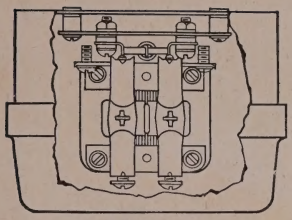
D - TUNING UNIT TU-50, 4.0 TO 5.0 MC. PART NO. 51A445.

E - TUNING UNIT TU-51, 5.0 TO 6.35 MC. PART NO. 51A446.

F - TUNING UNIT TU-52, 6.35 TO 8.0 MC. PART NO. 51A447.

TL 19870

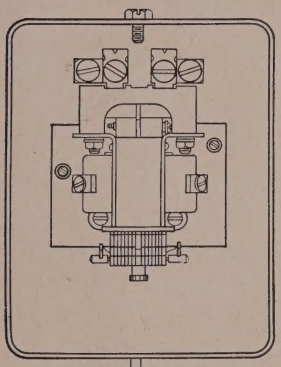
Figure 45. Radio Transmitter BC–610–A, BC–610–B, BC–610–C, BC–610–D, tuning units, practical wiring diagram.



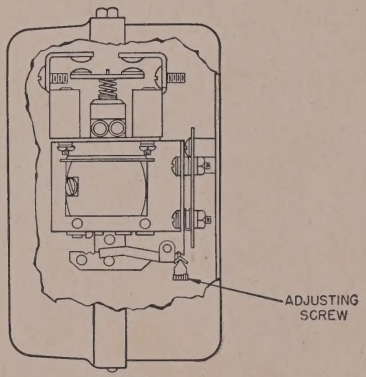
TOP VIEW

RELAY RY1
PART NO. 21D056
SIG. C. STOCK NO. 2Z7590-88
USED ON RADIO TRANSMITTER
USED ON BC-610-A,B,C,D & E

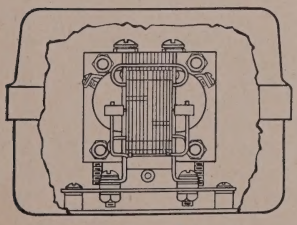
APPROVED TYPE
ALLEN BRADLEY A 209(MODIFIED)



FRONT VIEW



SIDE VIEW



BOTTOM VIEW

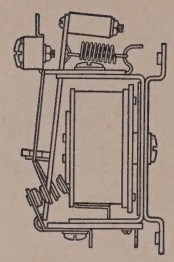
ELECTRICAL CHARACTERISTICS

NOMINAL OPERATING VOLTAGE - 117 V. A-C 50/60 CYCLES.
PULL IN VOLTAGE - A-C 60 CYC 90V OR LESS.
RELAY MUST BE ADJUSTED TO OPERATE AT 95 V.AC WITHOUT BUZZING.
COIL RESISTANCE 97 OHMS ± 10 %.
RELAY BUILT FOR TROPICAL SERVICE OPERATION.
CIRCUIT - DOUBLE POLE SINGLE THROW NORMALLY OPEN.
CONTACTS RATED AT 20 AMPS. 90 % P.F. LOAD: 25 AMPS NON-INDUCTIVE LOAD.
CONTINUOUS DUTY AT 115 V. A-C 60 CYCLES.
TEMPERATURE RISE OF COIL MUST NOT EXCEED 70°C. IN AIR AS MEASURED BY THE RESISTANCE METHOD.
ALL FERROUS PARTS OF RELAY ARE ZINC CHROMATE TREATED EXCEPT POLE FACES.
ALL CONTACTS AND TERMINALS ARE SILVER PLATED.

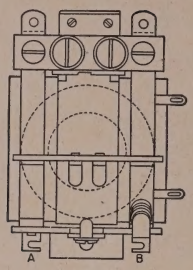
TL 11927-S

Figure 46. Radio Transmitter BC-615-(*), relay RY1, front and bottom views.

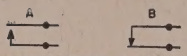
RELAY RY2
PART NO. 21A006-D
SIG. C. STOCK NO. 2Z7717.5
USED ON BC-610-A,B,C,D & E



SIDE VIEW



FRONT VIEW



MAKE BEFORE BREAK
CONTACT ARRANGEMENT

APPROVED TYPE
GUARDIAN NO. G32423

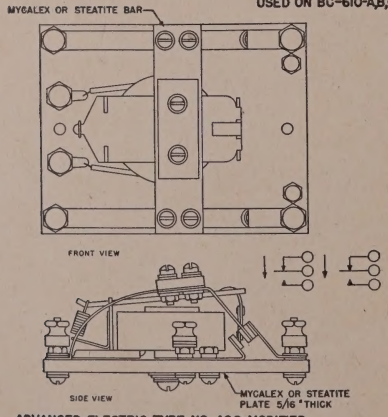
ELECTRICAL CHARACTERISTICS

NORMAL OPERATING VOLTAGE-115V A-C 60 CYCLES.
MINIMUM OPERATING VOLTAGE-95V A-C 60 CYCLES.
BREAK DOWN VOLTAGE BETWEEN WINDING AND FRAME-1500 V.
RESISTANCE OF COIL-750 OHMS.
CONTACTS TO BE FINE SILVER.
COIL TO BE VARNISH IMPREGNATED FOR TROPICAL SERVICE.
ARMATURE TO BE COUNTER-BALANCED FOR OPERATION UNDER VIBRATION.
A-CONTACT TO HAVE 50 GRAMS CONTACT PRESSURE.
B-CONTACT TO HAVE 25 GRAMS CONTACT PRESSURE.
ALL LAMINATED PHENOLIC TO BE VACUUM WAX IMPREGNATED BEFORE ASSEMBLY WITH ZOPHAR # 1539 WAX OR EQUAL.

TL 19874

Figure 47. Radio Transmitter BC-610-(*), relay RY2, front and side views.

RELAY RY3
PART NO. 21B001
SIG. C. STOCK NO. 2Z7717.2
USED ON BC-610-A,B,C,D & E



ADVANCED ELECTRIC TYPE NO. 400 MODIFIED

ELECTRICAL CHARACTERISTICS

NORMAL OPERATING VOLTAGE-115 V A-C 50-60 CYCLES
PULL-IN VOLTAGE- 95 V A-C.
CONTACT RATING-1/2 AMP. @ 2000V EACH.
CONTACTS TO BE 1/4" DIA. FINE SILVER.
COILS TO BE IMPREGNATED FOR TROPICAL SERVICE.
RELAY SHALL OPERATE WITHOUT CHATTERING AT 95 VOLTS A-C. ①
RELAY SHALL NOT CHATTER WHEN OPERATED AT 110 VOLTS A-C AND SUBJECT TO A VIBRATION ACCELERATION OF 8G.
CONTACT PRESSURE TO BE NOT LESS THAN 30 GRAMS IN EITHER ENERGIZED OR NON-ENERGIZED POSITION.
ALL LAMINATED PHENOLIC TO BE VACUUM WAX IMPREGNATED BEFORE ASSEMBLY WITH ZOPHAR #1539 WAX OR EQUAL.

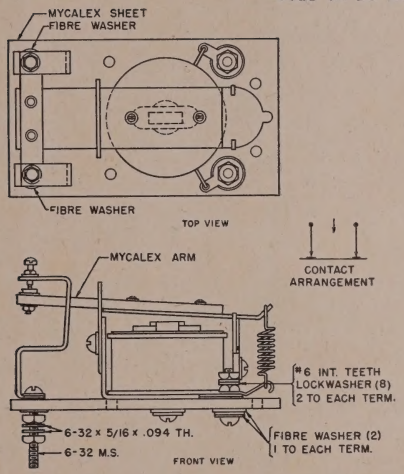
REVISION

① 95 VOLTS WAS 90 VOLTS.

TL19875

Figure 48. Radio Transmitter BC-610-(*), relay RY3, front and side views.

RELAY RY4
PART NO. 21A003-E
SIG. C. STOCK NO. 2Z7717.3
USED ON BC-610-A,B,C,D & E



ELECTRICAL CHARACTERISTICS

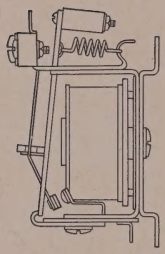
NORMAL OPERATING VOLTAGE - 115 V A-C AT 50/60 C.P.S.
PULL-IN VOLTAGE - 55 TO 90V A-C
D-C COIL RESISTANCE - 480 OHMS.
COIL TO BE IMPREGNATED FOR TROPICAL SERVICE.
VOLTAGE BREAKDOWN TO FRAME - 1000 V.
SINGLE POLE SINGLE THROW NORMALLY CLOSED CONTACT ARRANGEMENT.
CONTACTS TO BE FINE SILVER.
ALL METAL PARTS TO HAVE A PROTECTIVE COATING OR PLATING
FIBRE WASHERS TO BE USED WHERE METAL PARTS FASTEN TO MYCALEX (ONLY AS SHOWN)
ALL LAMINATED PHENOLIC TO BE VACUUM IMPREGNATED BEFORE ASSEMBLY WITH ZOPHAR # 1539 WAX OR EQUAL

TL19876

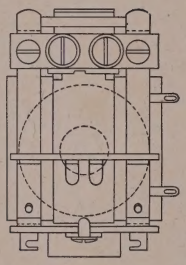
APPROVED TYPE - LEACH RELAY CO. TYPE 1702 MX

Figure 49. Radio Transmitter BC-610-(*), r-f relay RY4, front and top views.

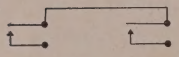
RELAY RY5
PART NO. 21A007
SIG. C. STOCK NO.2Z7717.4
USED ON BC-610-A,B,C,D&E



SIDE VIEW



FRONT VIEW



CONTACT ARRANGEMENT

APPROVED TYPE ③
GUARDIAN NO.G32422

ELECTRICAL CHARACTERISTICS

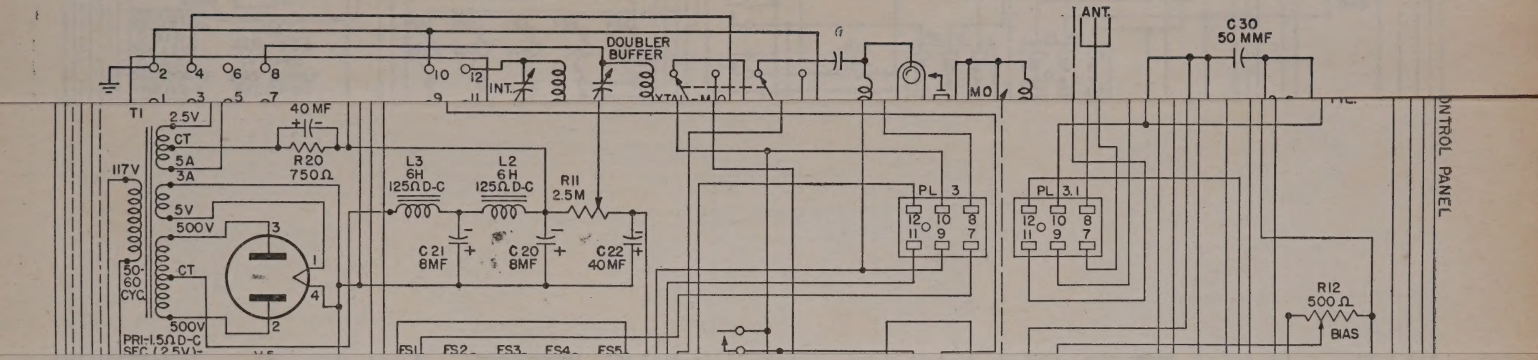
① PULL-IN CURRENT-800MA② ±10MA
COIL RESISTANCE - 6 OHMS
BREAKDOWN VOLTAGE BETWEEN WINDING AND GROUND 900 V
COIL TO BE VARNISH IMPREGNATED FOR TROPICAL SERVICE
ARMATURE TO BE COUNTER-BALANCED FOR OPERATION UNDER VIBRATION.
ALL LAMINATED PHENOLIC TO BE VACUUM WAX IMPREGNATED BEFORE ASSEMBLY WITH ZOPHAR #1539 WAX OR EQUAL.

REVISIONS

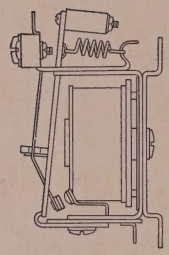
① "PULL-IN" WAS TERMED "OPERATING"
② 800 MA WAS 750, 700 AND 650
③ G 32422 WAS G 32423

TL19877

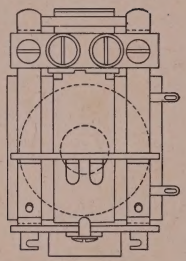
Figure 50. Radio Transmitter BC–610–(*), overload relay RY5, front and side views.


ANT.
C30
50 MMF
DOUBLER
BUFFER
INT.
XTAL
MO
T1
2.5V
CT
5A
3A
117V
5V
500V
CT
50-
60
CYC.
500V
PRI-1.5Ω D-C
40 MF
R20
750Ω
L3
6H
125Ω D-C
L2
6H
125Ω D-C
R11
2.5M
C21
8MF
C20
8MF
C22
40MF
PL 3
PL 3.1
R12
500Ω
BIAS
CONTROL PANEL

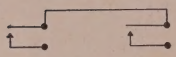
RELAY RY5
PART NO. 21A007
SIG. C. STOCK NO. 2Z7717.4
USED ON BC-610-A, B, C, D & E



SIDE VIEW



FRONT VIEW



CONTACT ARRANGEMENT

APPROVED TYPE ③
GUARDIAN NO. G32422

ELECTRICAL CHARACTERISTICS

① PULL-IN CURRENT - 800MA ② ±10MA
COIL RESISTANCE - 6 OHMS
BREAKDOWN VOLTAGE BETWEEN WINDING AND GROUND 900 V
COIL TO BE VARNISH IMPREGNATED FOR TROPICAL SERVICE
ARMATURE TO BE COUNTER-BALANCED FOR OPERATION UNDER VIBRATION.
ALL LAMINATED PHENOLIC TO BE VACUUM WAX IMPREGNATED BEFORE ASSEMBLY WITH ZOPHAR #1539 WAX OR EQUAL.

REVISIONS

① "PULL-IN" WAS TERMED "OPERATING"
② 800 MA WAS 750, 700 AND 650
③ G 32422 WAS G 32423

TL19877

Figure 50. Radio Transmitter BC-610-(*), overload relay RY5, front and side views.

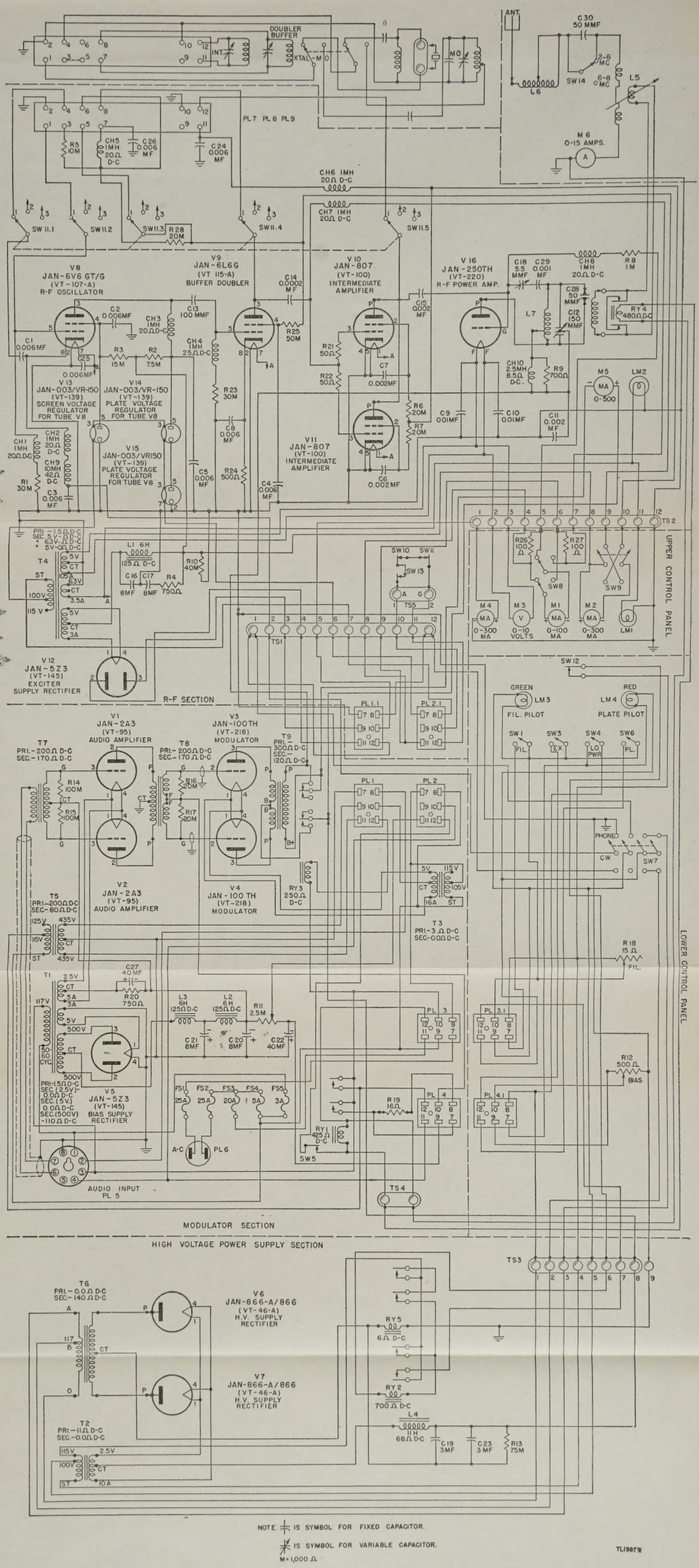
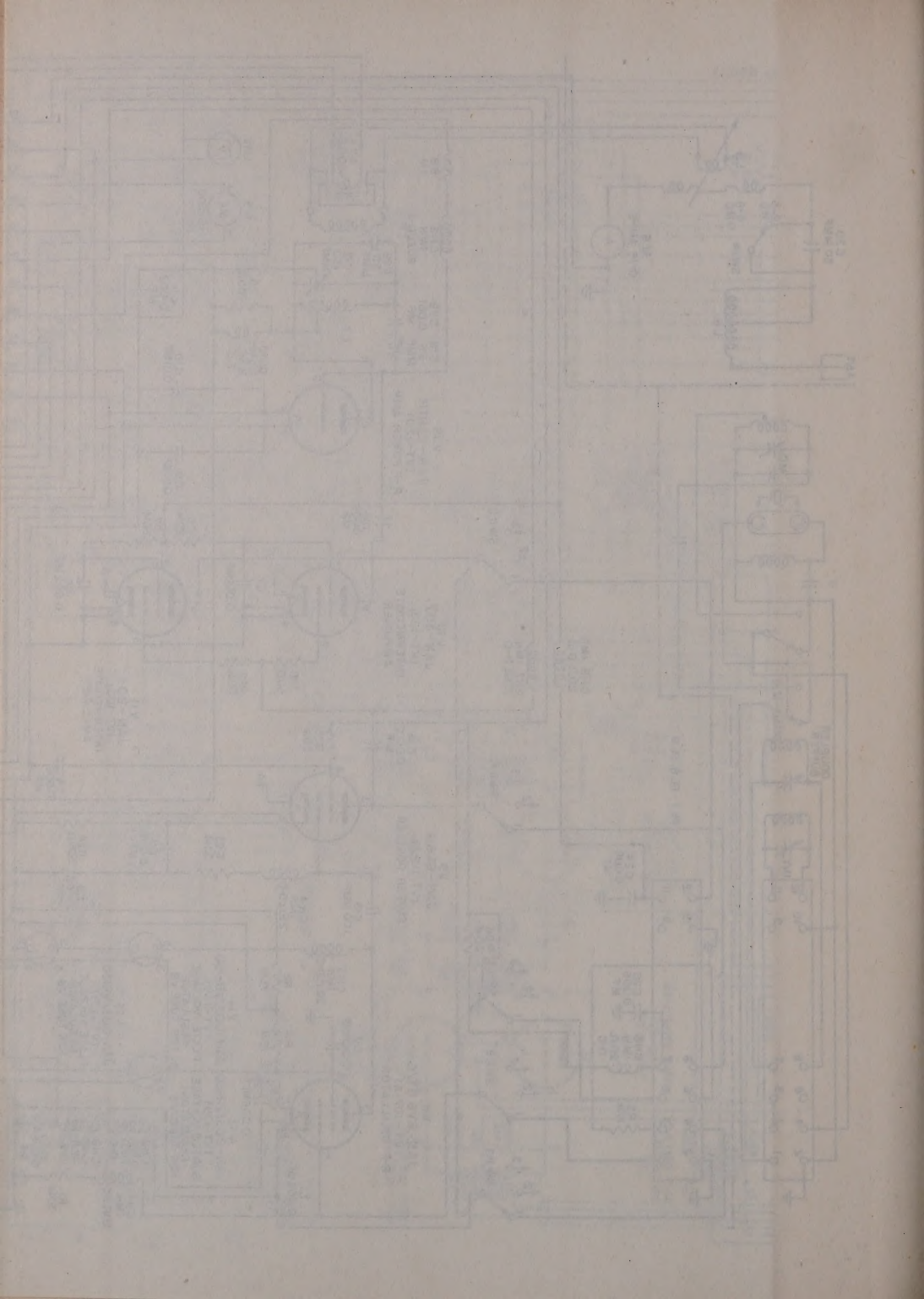


Figure 51. Radio Transmitters BC-610-A, and BC-610-B, and Antenna Tuning Unit BC-729-(*), schematic wiring diagram.



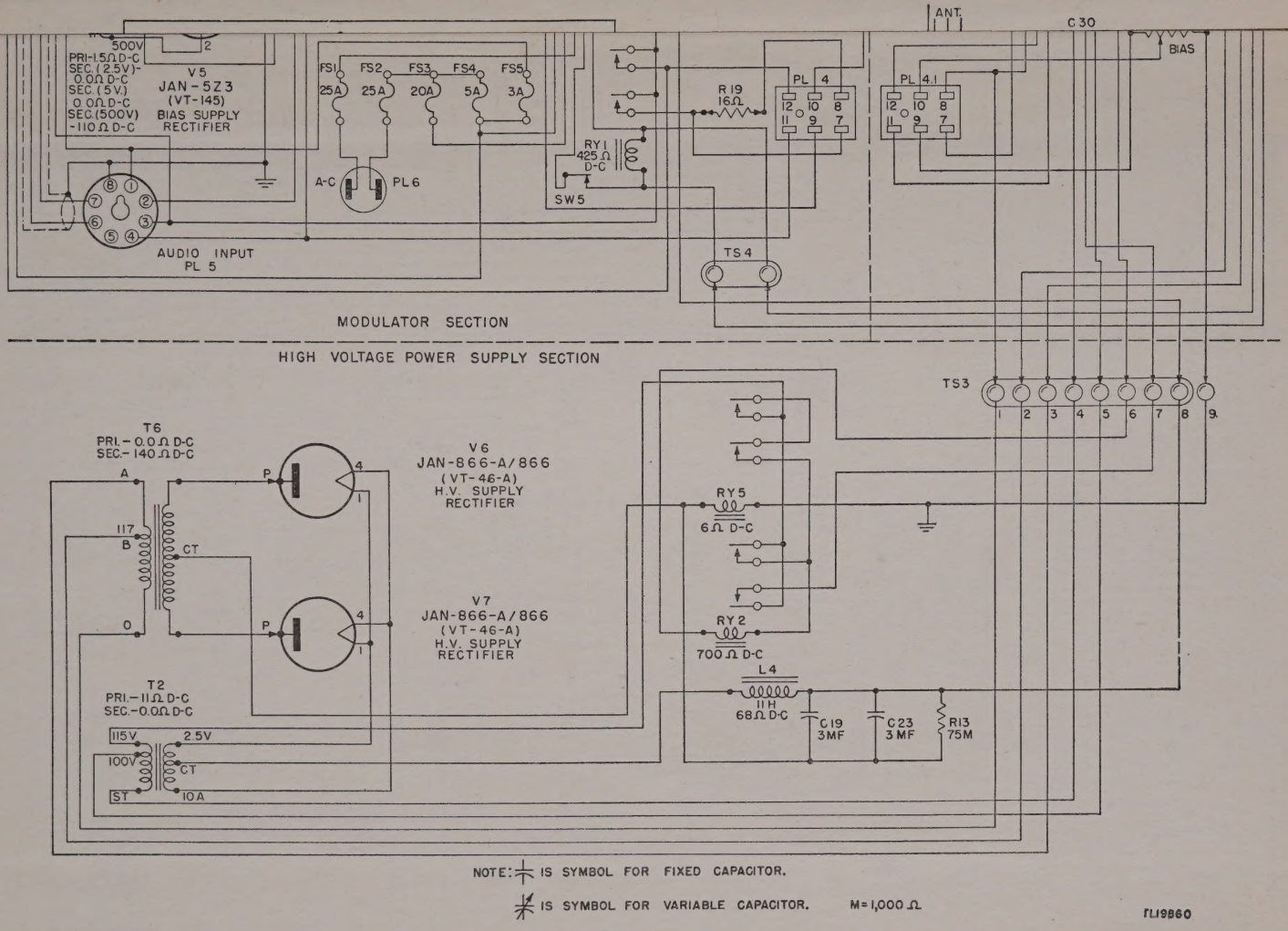
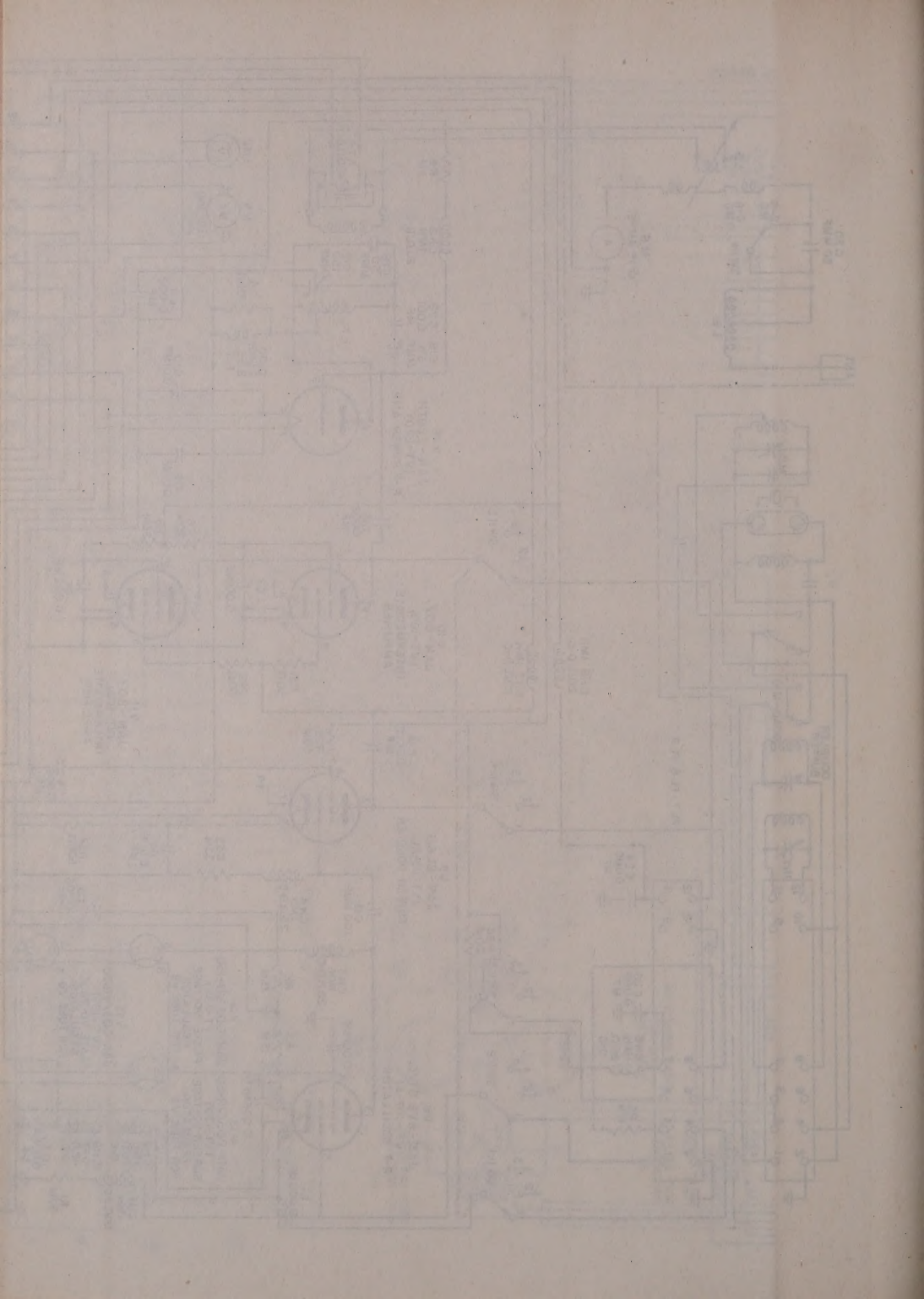


Figure 52. Radio Transmitter BC-610-C and Antenna Tuning Unit BC-729-(*), schematic wiring diagram.



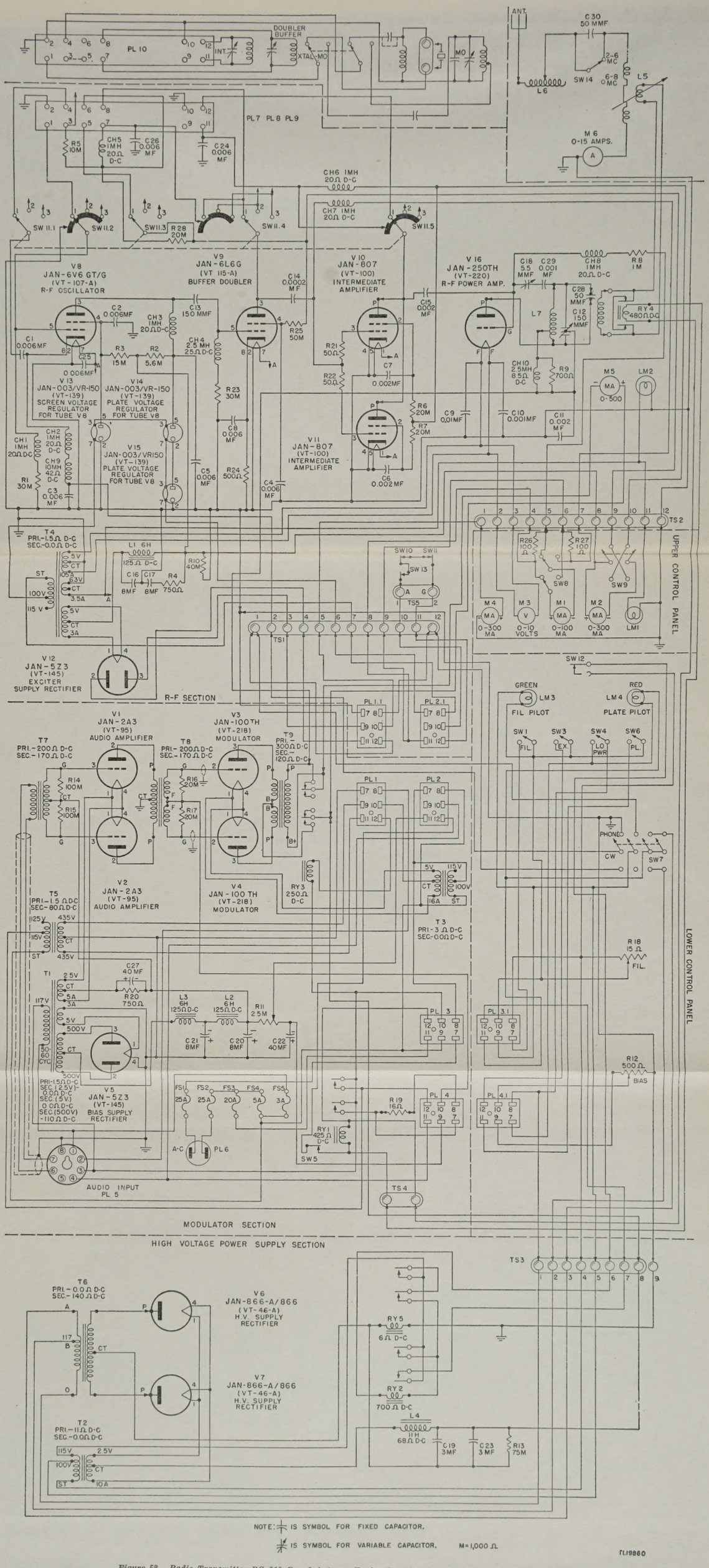
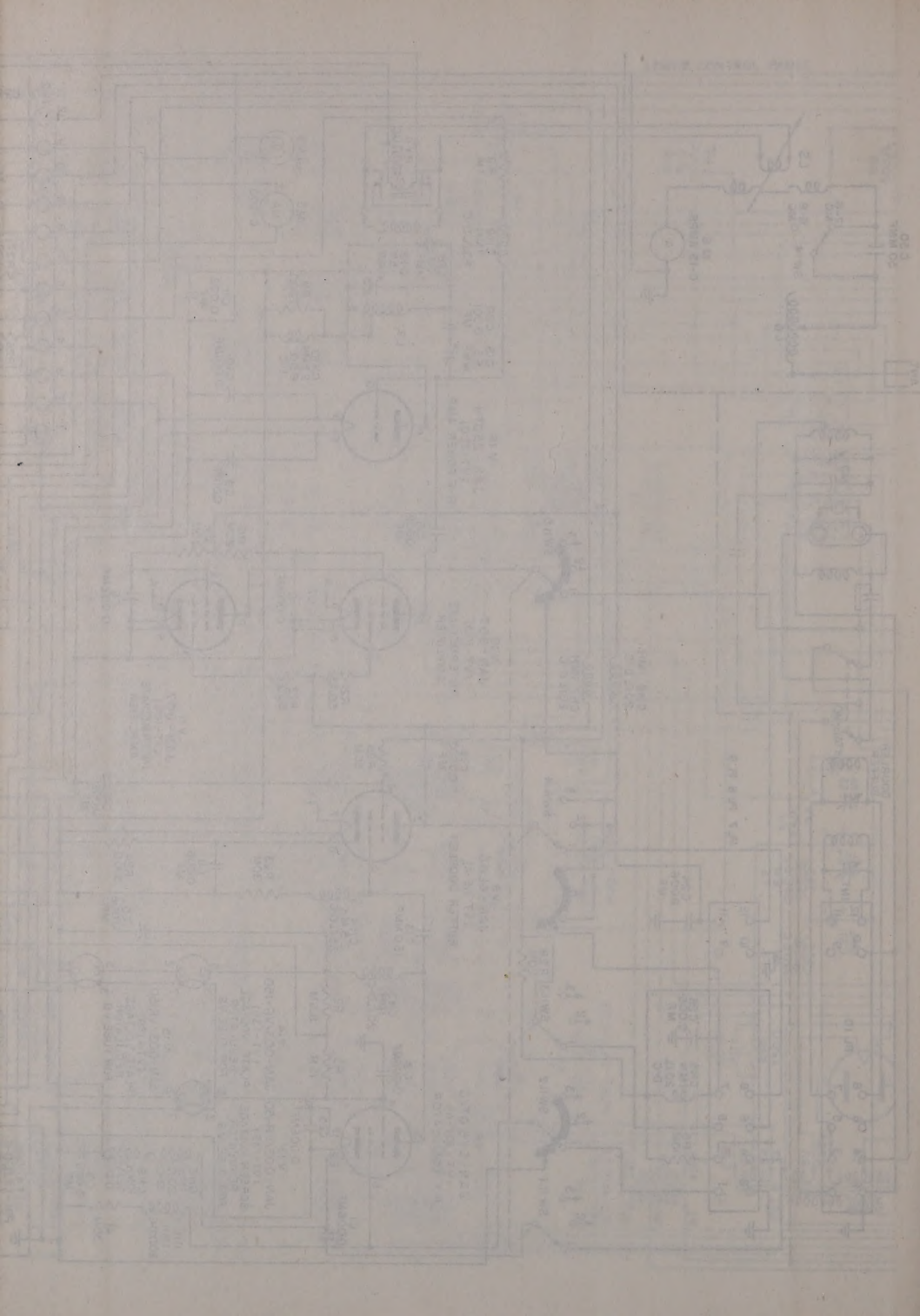
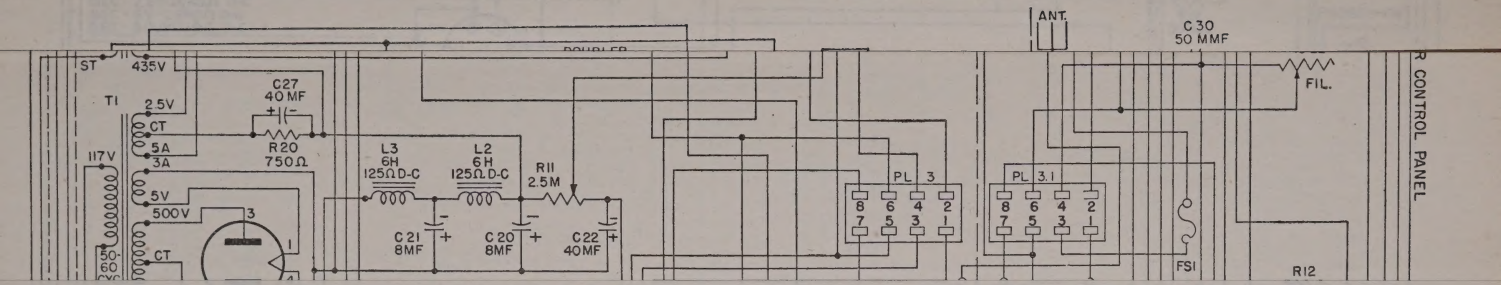
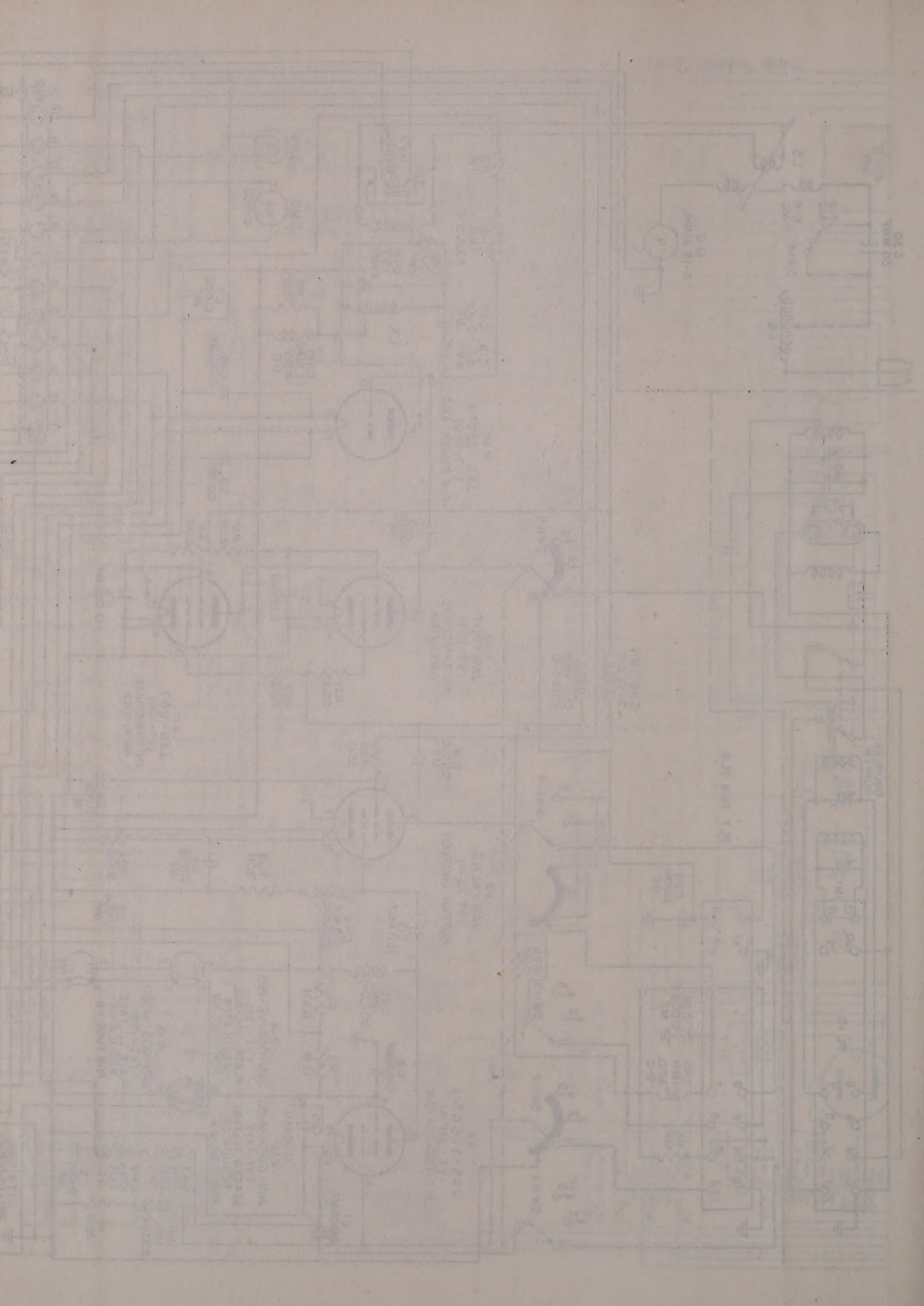


Figure 52. Radio Transmitter BC-610-C and Antenna Tuning Unit BC-729-(*), schematic wiring diagram.




ANT.
C30
50 MMF
FIL.
R CONTROL PANEL
ST
435V
T1
25V
CT
5A
3A
117V
5V
500V
CT
C27
40 MF
R20
750Ω
L3
6H
125Ω D-C
L2
6H
125Ω D-C
R11
2.5M
C21
8MF
C20
8MF
C22
40MF
PL 3
PL 3.1
8 6 4 2
7 5 3 1
FSI
R12



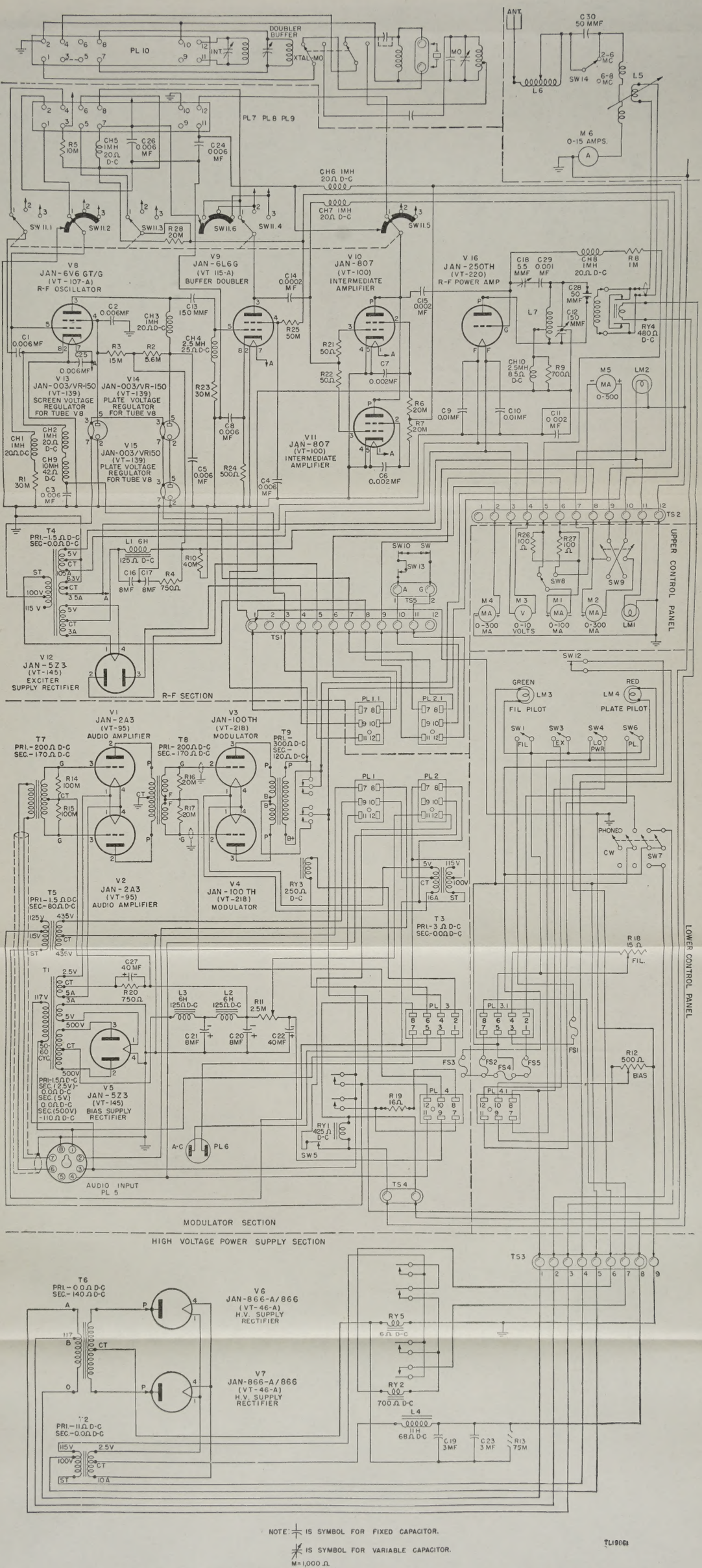
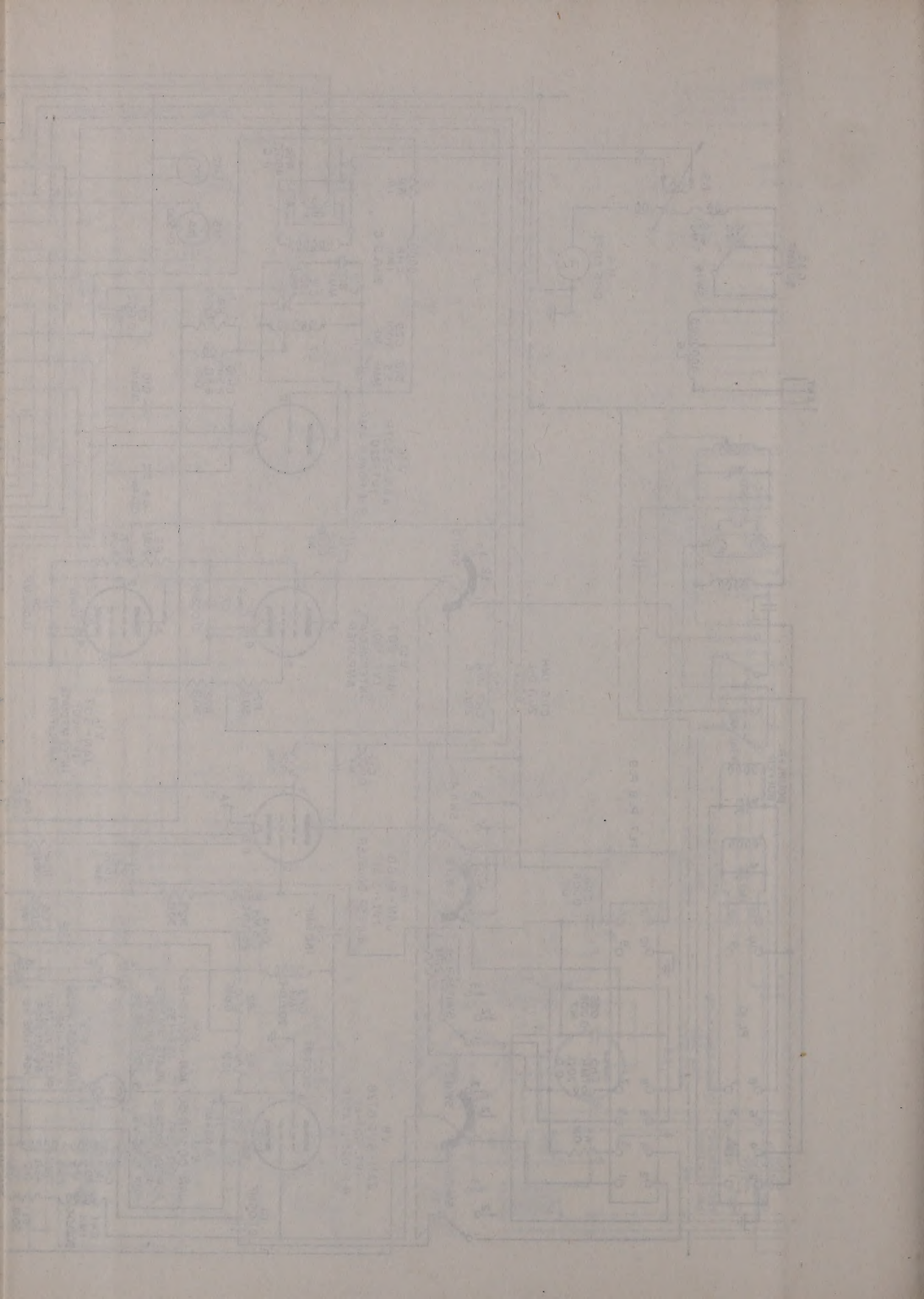
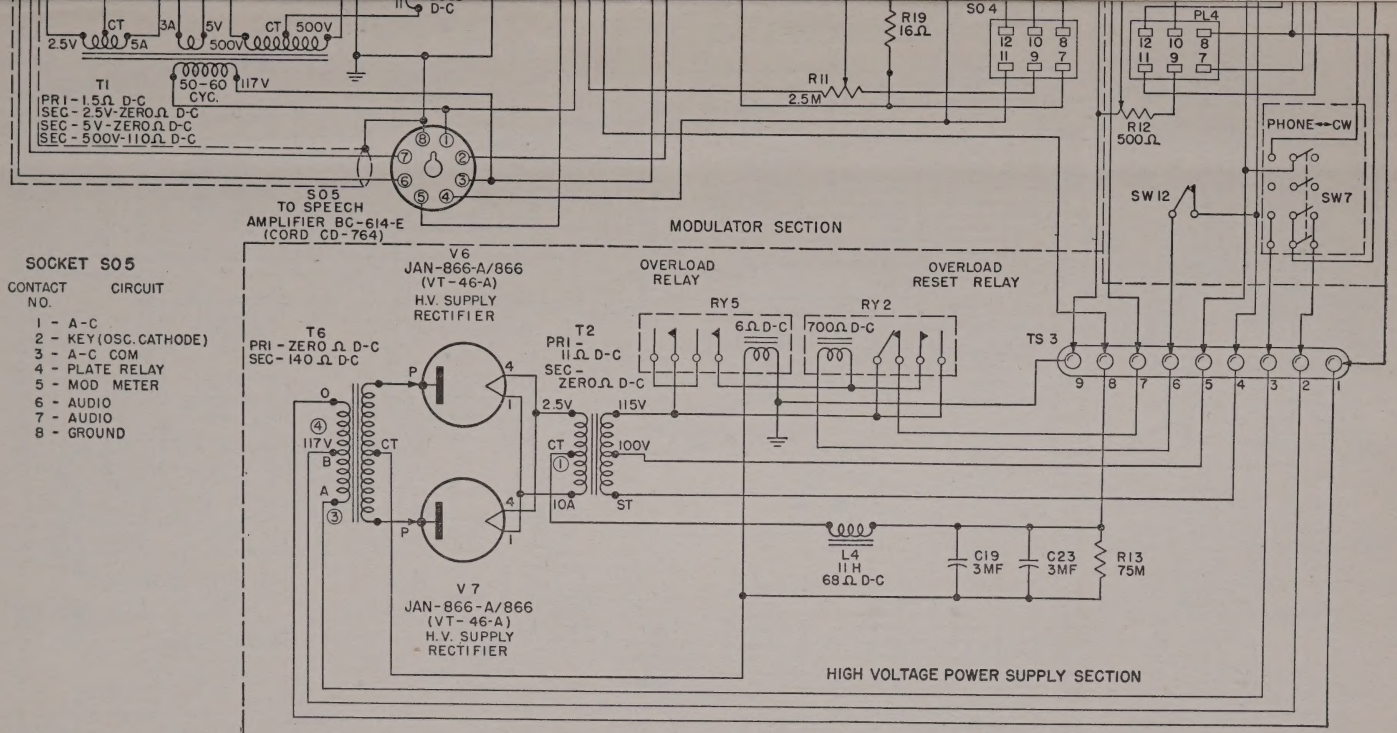


Figure 53. Radio Transmitter BC-610-D and Antenna Tuning Unit BC-729-(*), schematic wiring diagram.





① ON SOME EQUIPMENTS SECONDARY OF TRANSFORMER T2 IS NOT CENTER TAPPED, & IN THIS CASE CHOKE L4 IS CONNECTED TO PIN 4 OF TUBE V6.

② CAPACITOR C29 REPLACED WITH 0.0002 MF, 5000 WORKING VOLTS D-C ON ORDER NO. 30204 - PHILA-43 IN MODELS FOLLOWING NO. 5066.

③ WITH SW7 AT PHONE POSITION, TAP A IS USED GIVING 2000 VOLTS ON SECONDARY TO C.T.

④ WITH SW7 AT CW POSITION, TAP B IS USED GIVING 2600 VOLTS ON SECONDARY TO C.T.

NOTE: RESISTANCE VALUES APPLY ONLY TO COMPONENTS DISCONNECTED FROM CIRCUIT; RESISTANCES LESS THAN 1Ω ARE GIVEN AS ZERO.

⊣⊢ IS SYMBOL FOR FIXED CAPACITOR.

⊣↗⊢ IS SYMBOL FOR VARIABLE CAPACITOR.

M = 1,000 Ω

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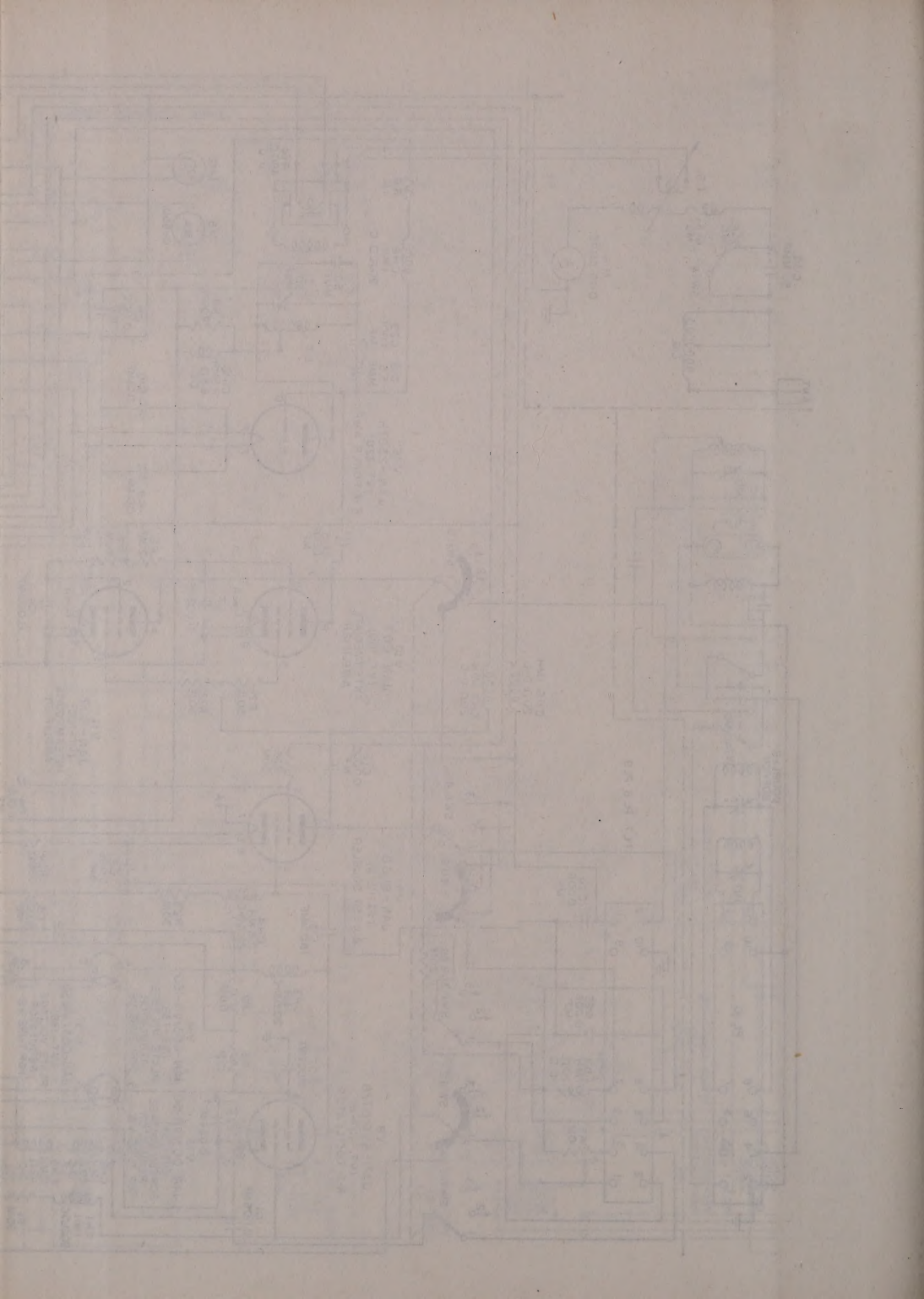
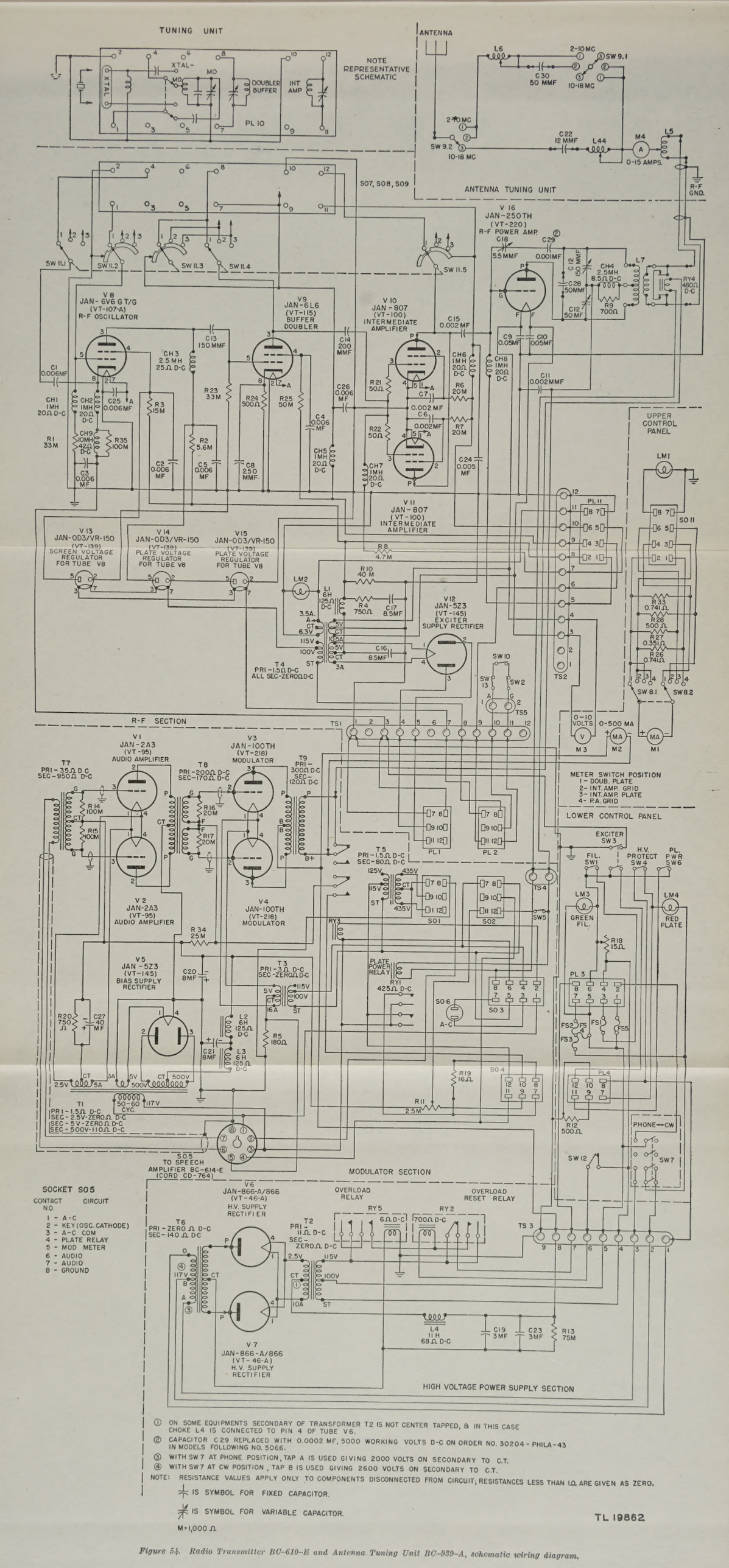
Figure 54. Radio Transmitter BC-610-E and Antenna Tuning Unit BC-939-A, schematic wiring diagram.





① ON SOME EQUIPMENTS SECONDARY OF TRANSFORMER T2 IS NOT CENTER TAPPED, & IN THIS CASE CHOKE L4 IS CONNECTED TO PIN 4 OF TUBE V6.

② CAPACITOR C29 REPLACED WITH 0.0002 MF, 5000 WORKING VOLTS D-C ON ORDER NO. 30204 - PHILA-43 IN MODELS FOLLOWING NO. 5066.

③ WITH SW 7 AT PHONE POSITION, TAP A IS USED GIVING 2000 VOLTS ON SECONDARY TO C.T.

④ WITH SW7 AT CW POSITION, TAP B IS USED GIVING 2600 VOLTS ON SECONDARY TO C.T.

NOTE: RESISTANCE VALUES APPLY ONLY TO COMPONENTS DISCONNECTED FROM CIRCUIT; RESISTANCES LESS THAN 1Ω ARE GIVEN AS ZERO.

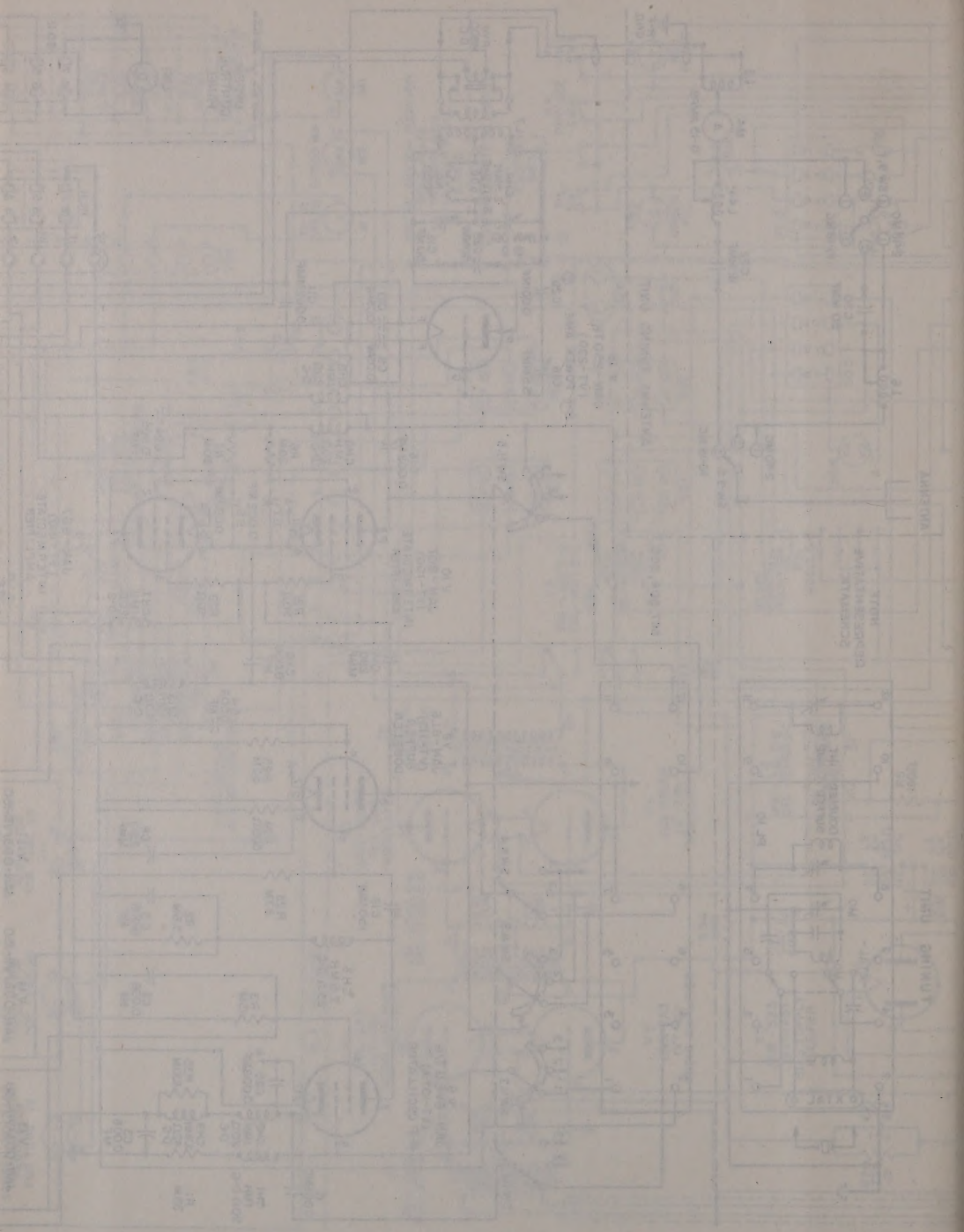
⏚ IS SYMBOL FOR FIXED CAPACITOR.

⏚ IS SYMBOL FOR VARIABLE CAPACITOR.

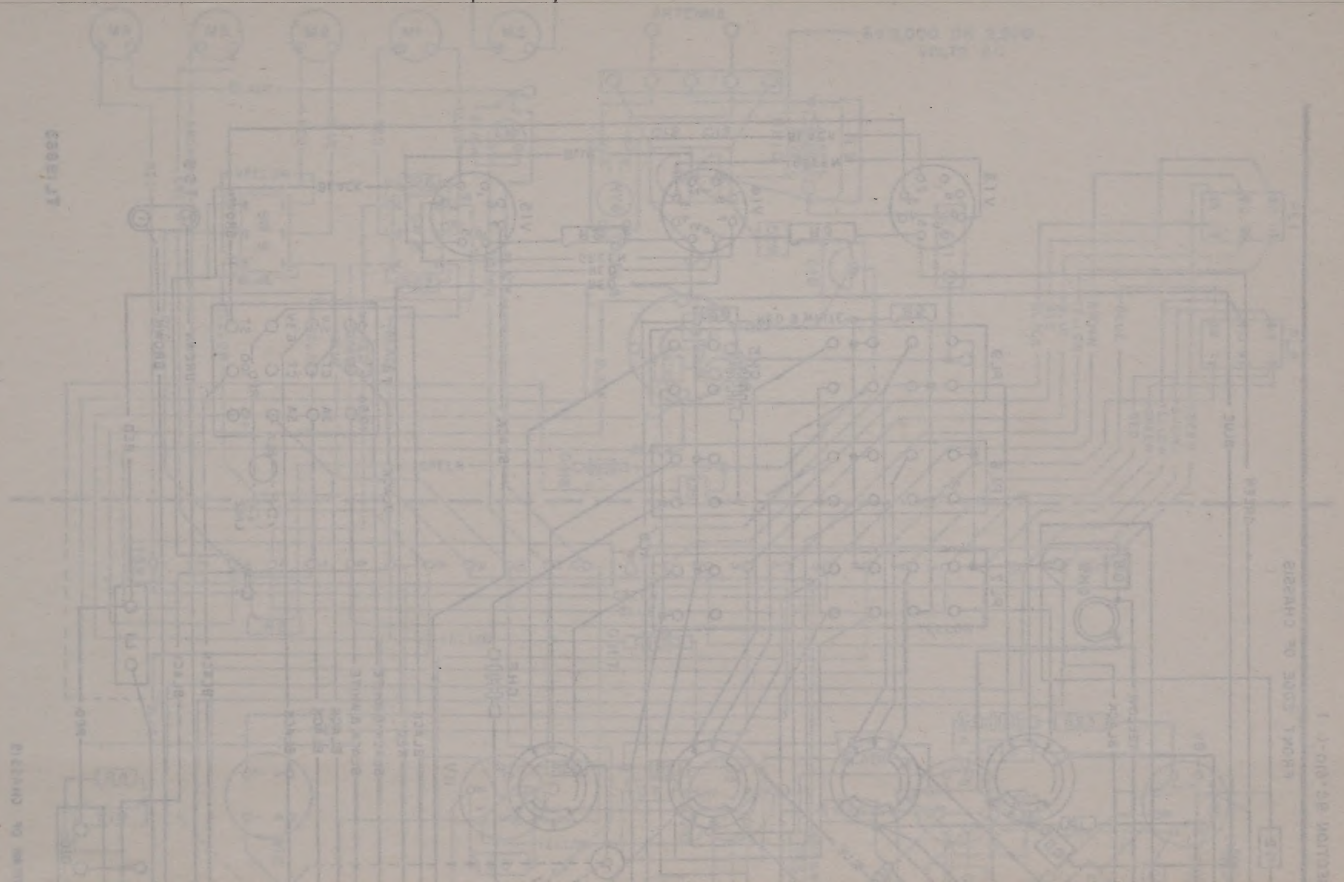
M = 1,000 Ω

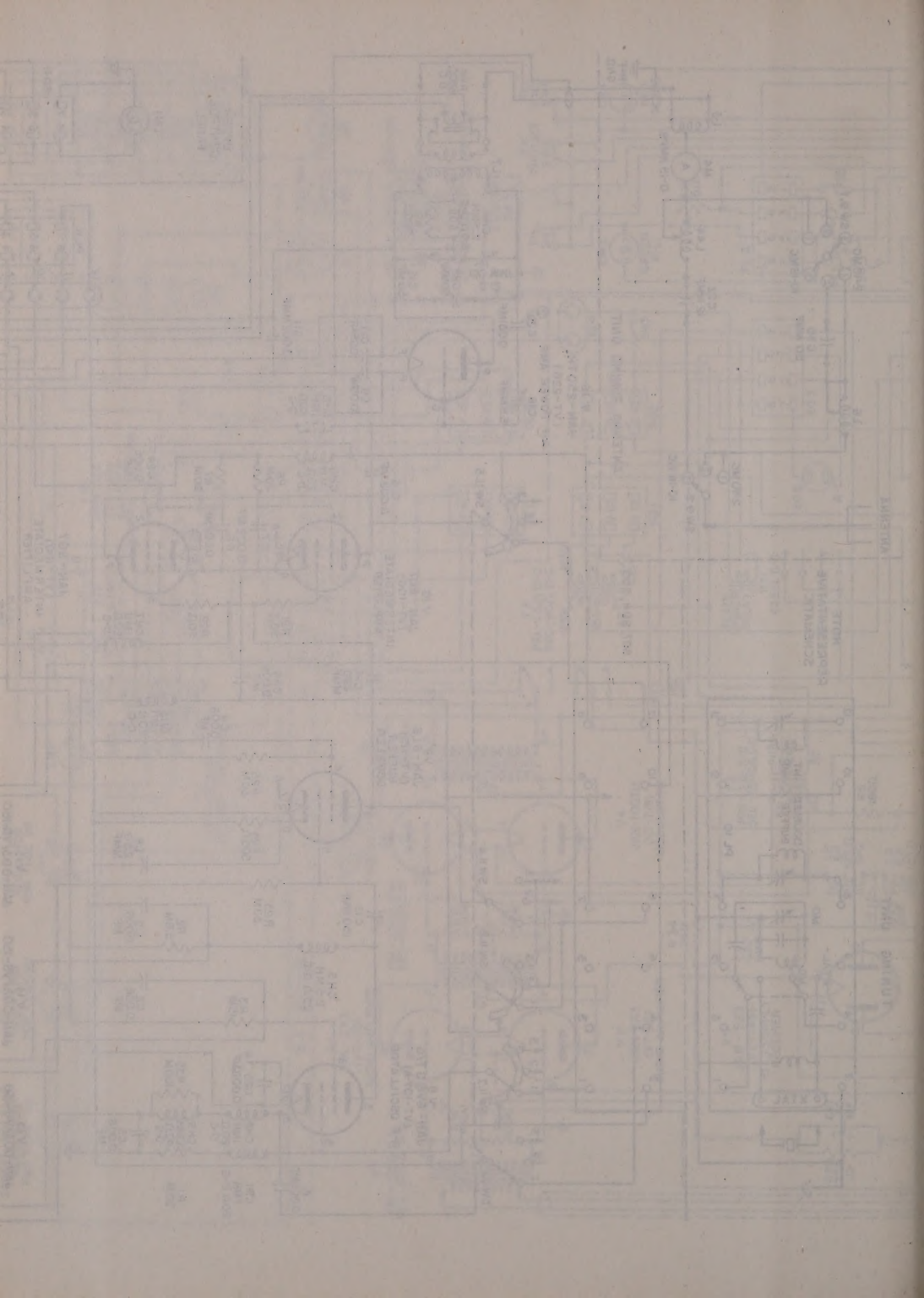
TL 19862

Figure 54. Radio Transmitter BC-610-E and Antenna Tuning Unit BC-939-A, schematic wiring diagram.



METERS AND SWITCHES ARE ON R-F PANELS TO MOD RELAY RY3





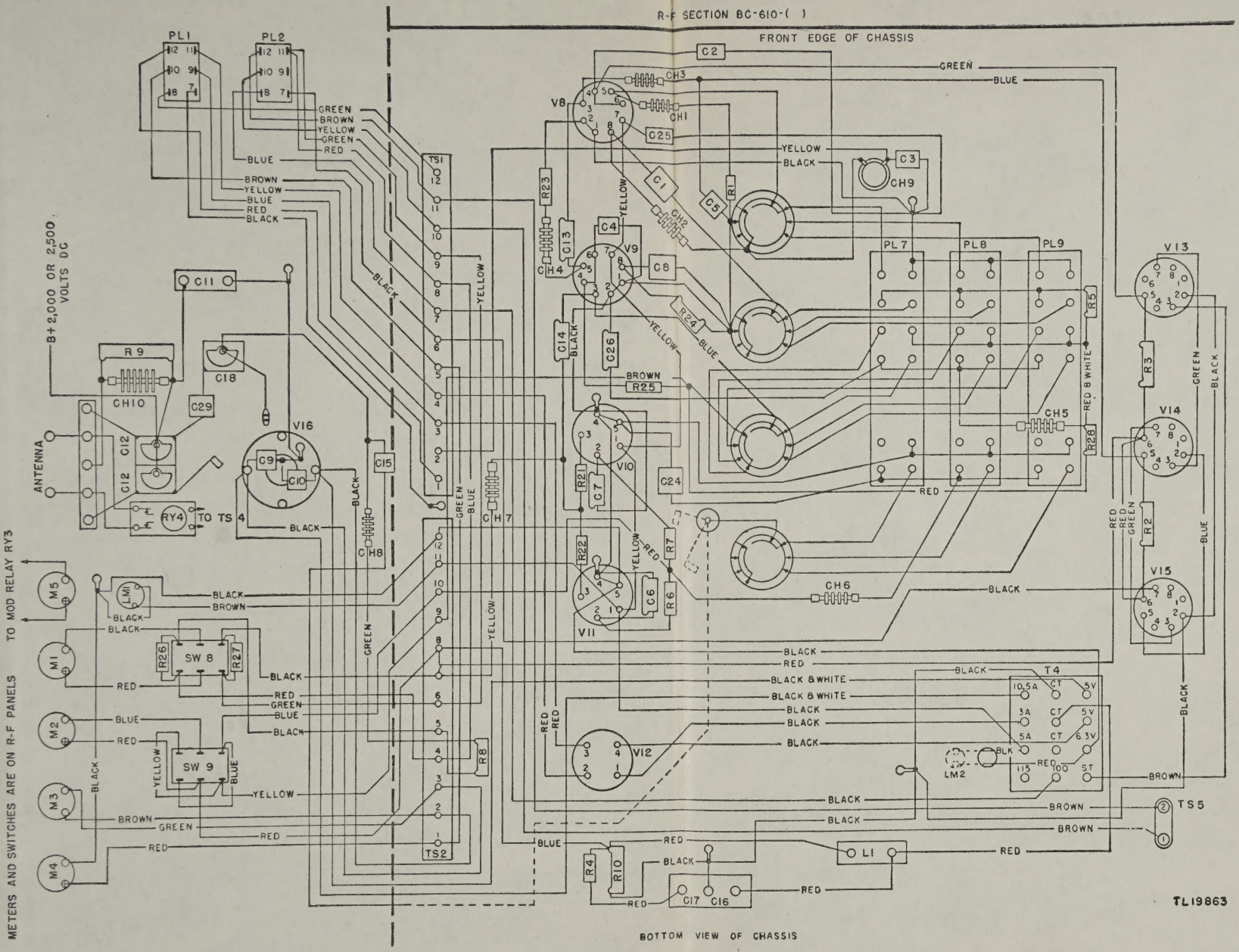
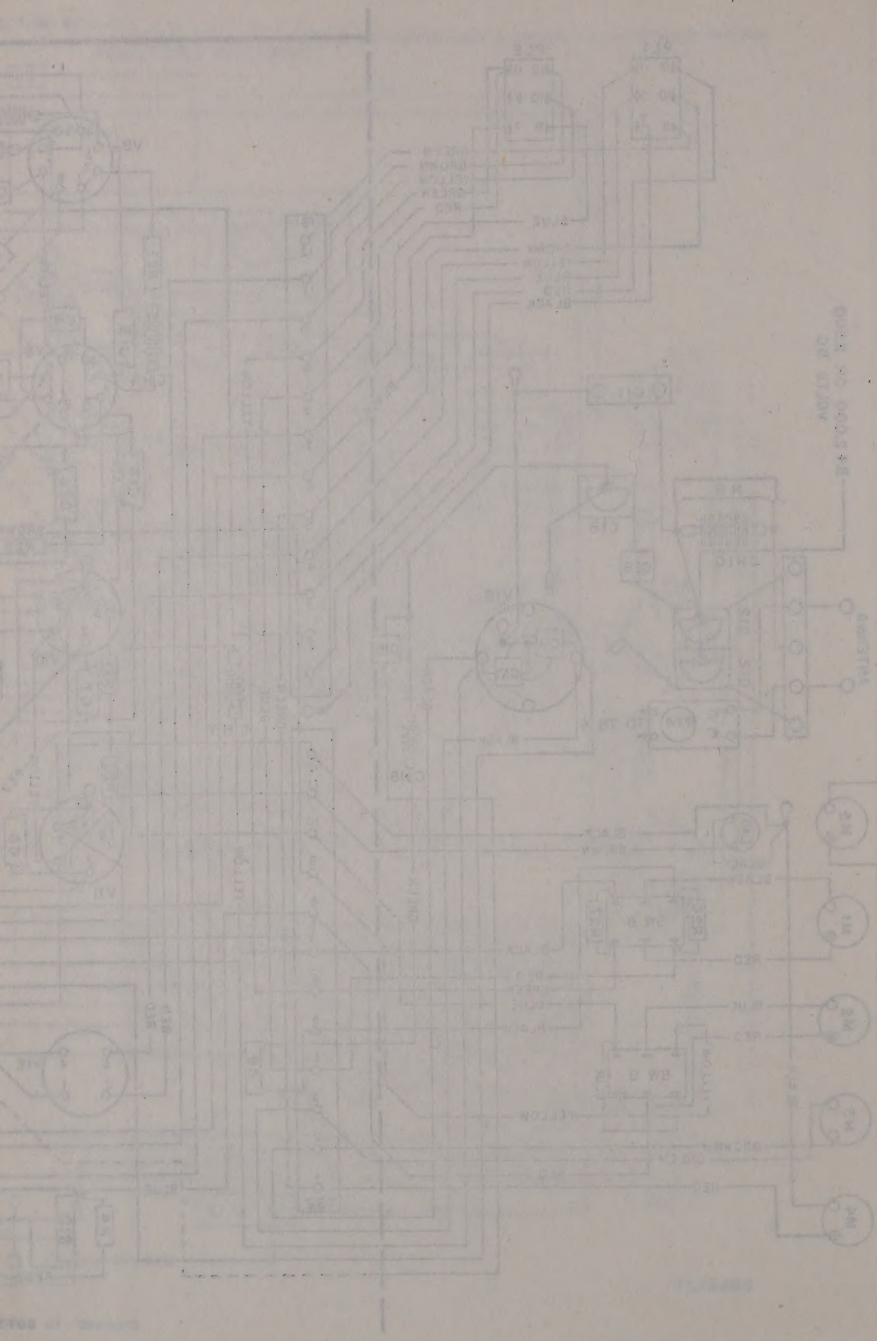
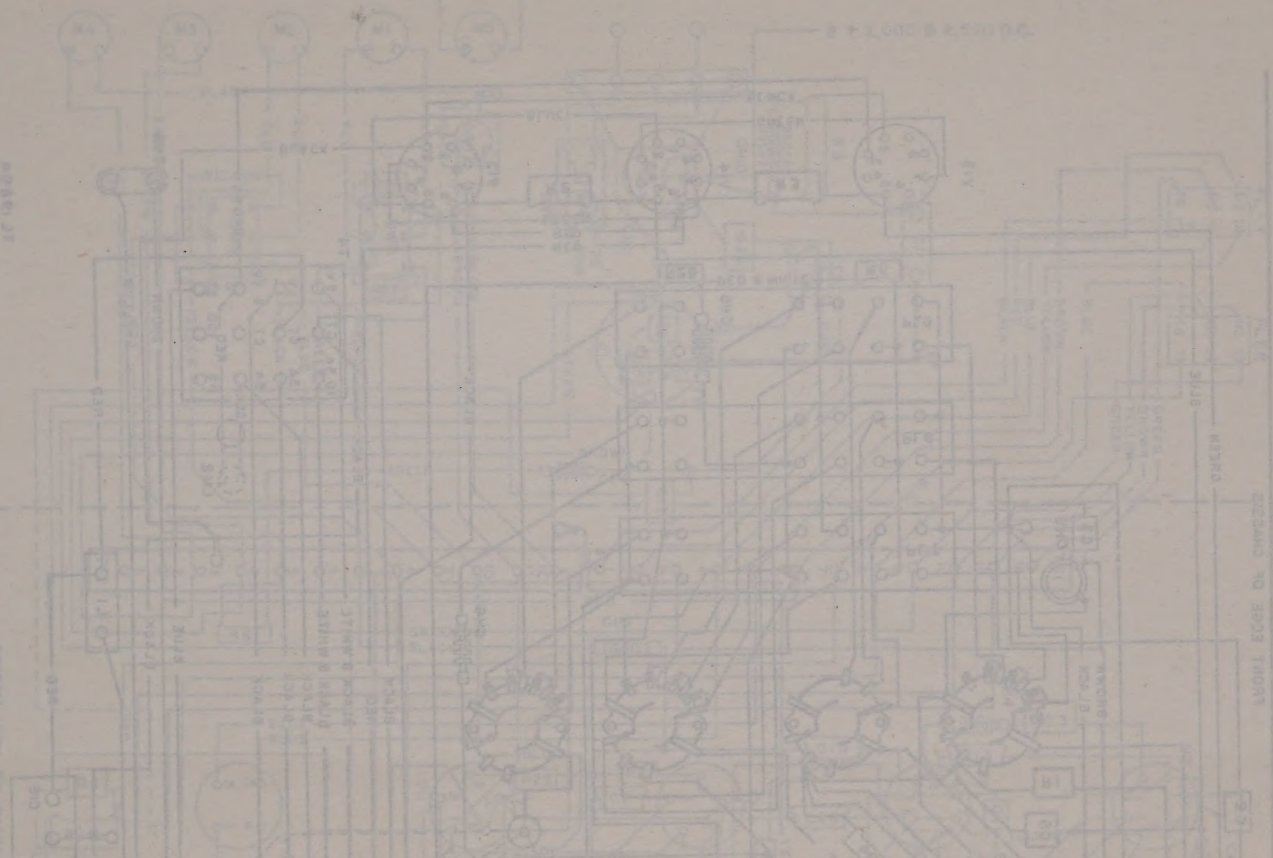
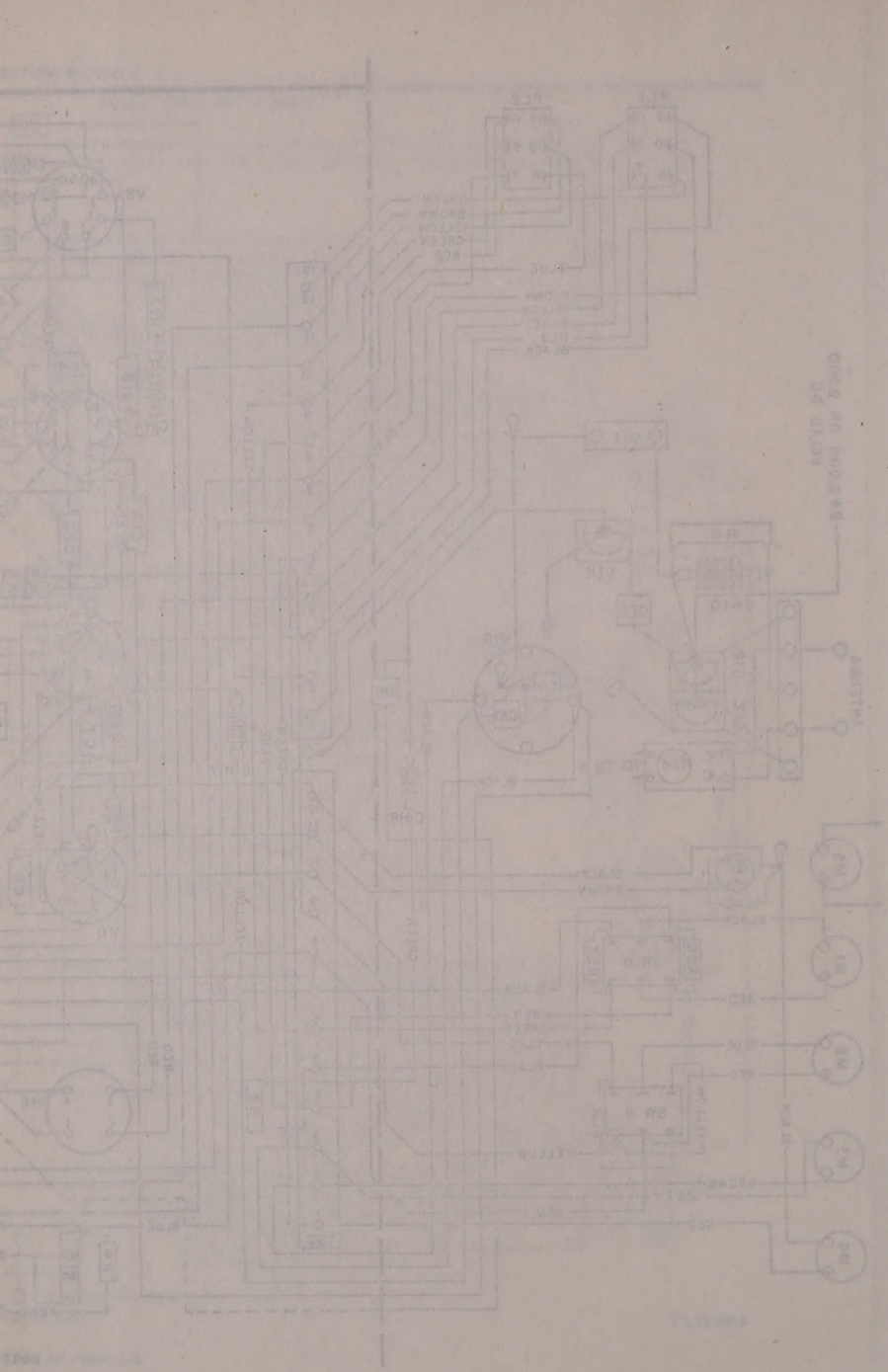


Figure 55. Radio Transmitters BC–610–A and BC–610–B, r-f section, practical wiring diagram.



METERS & SWITCHES ARE ON RF PANEL





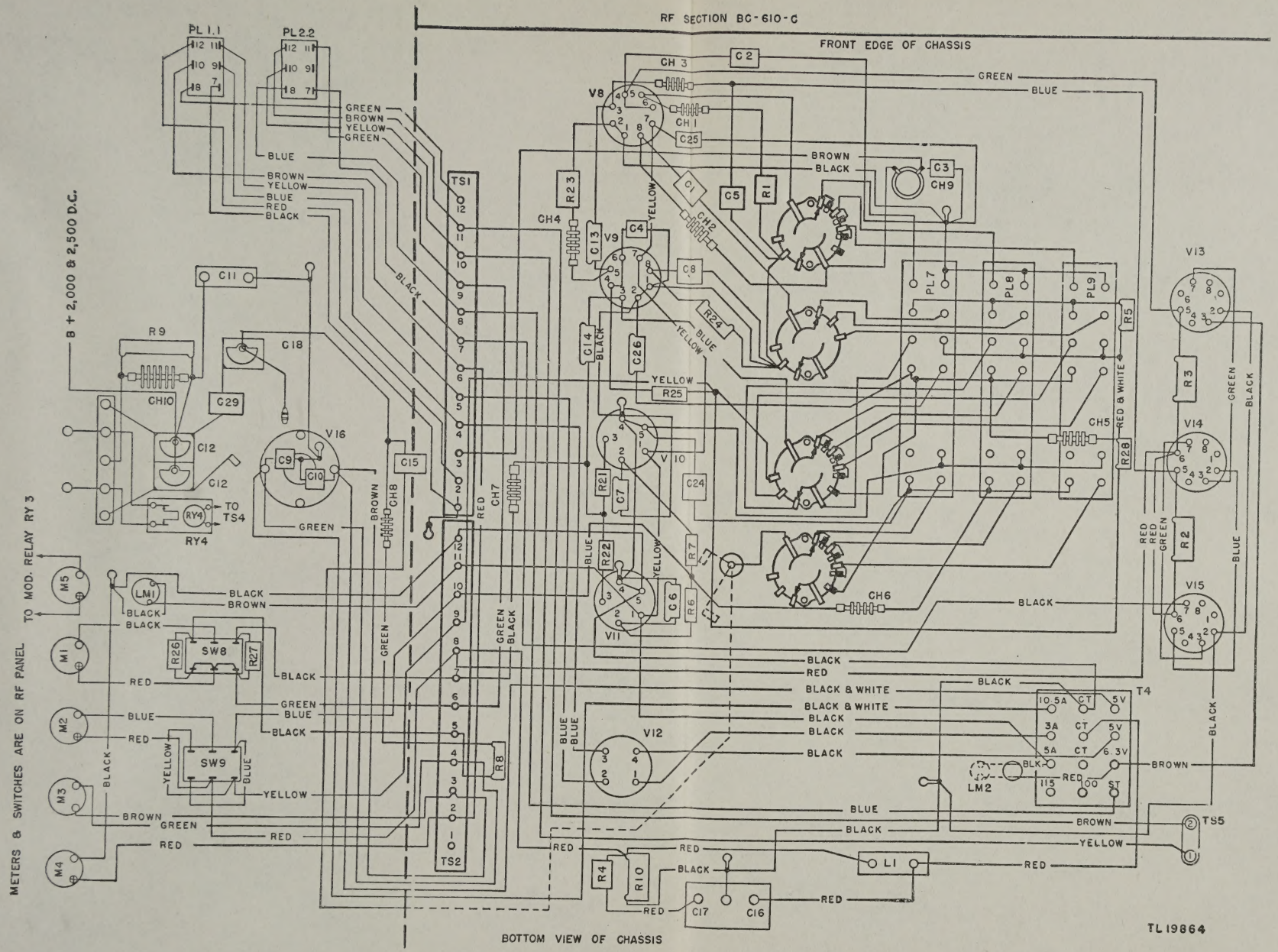
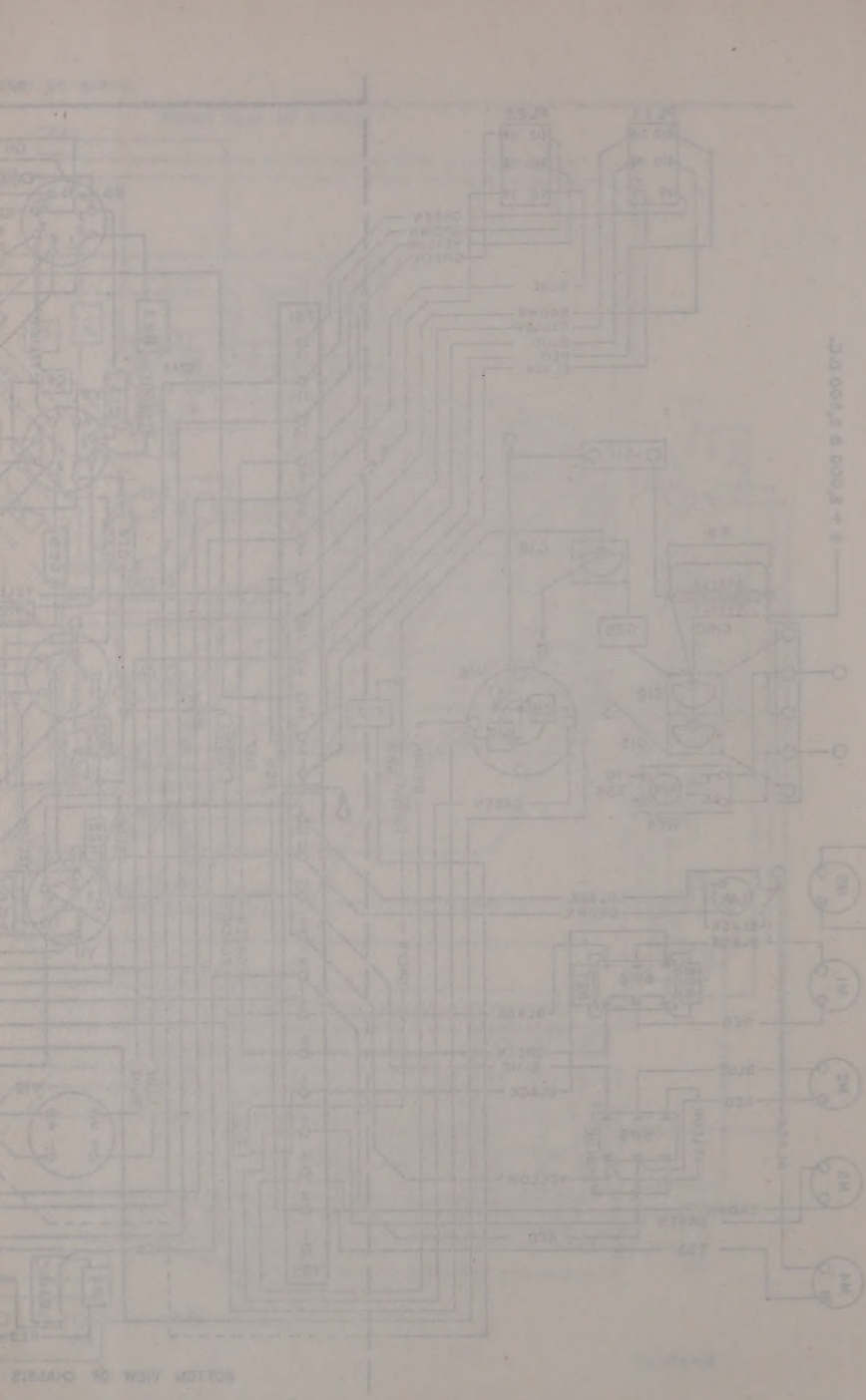
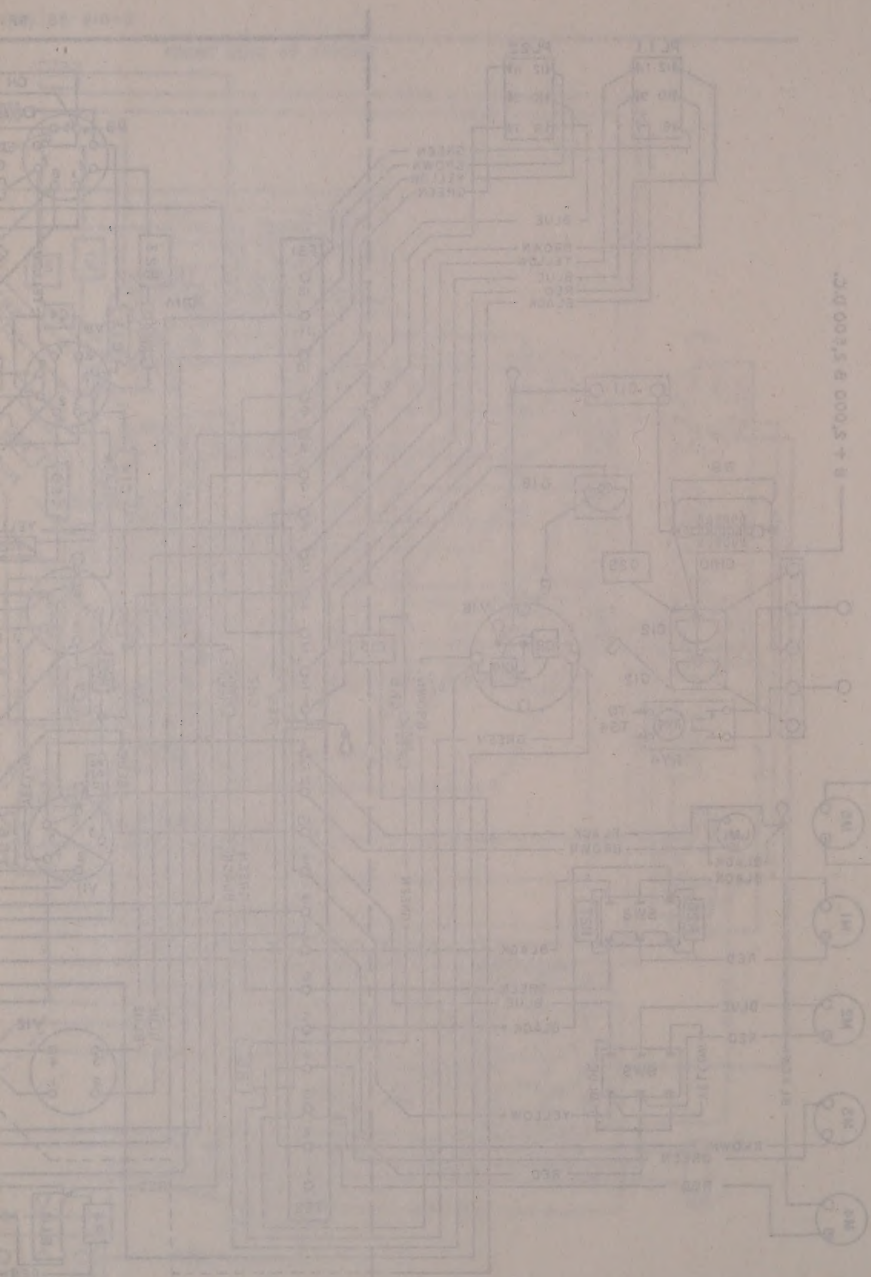


Figure 56. Radio Transmitter BC–610–C, r-f section, practical wiring diagram.



METERS & SWITCHES ARE ON RF PANEL
TO MOD RELAY RY3
M4
M3
M2
M1
M5
ANTENNA
B+ 2,000 & 2,500 D.C.



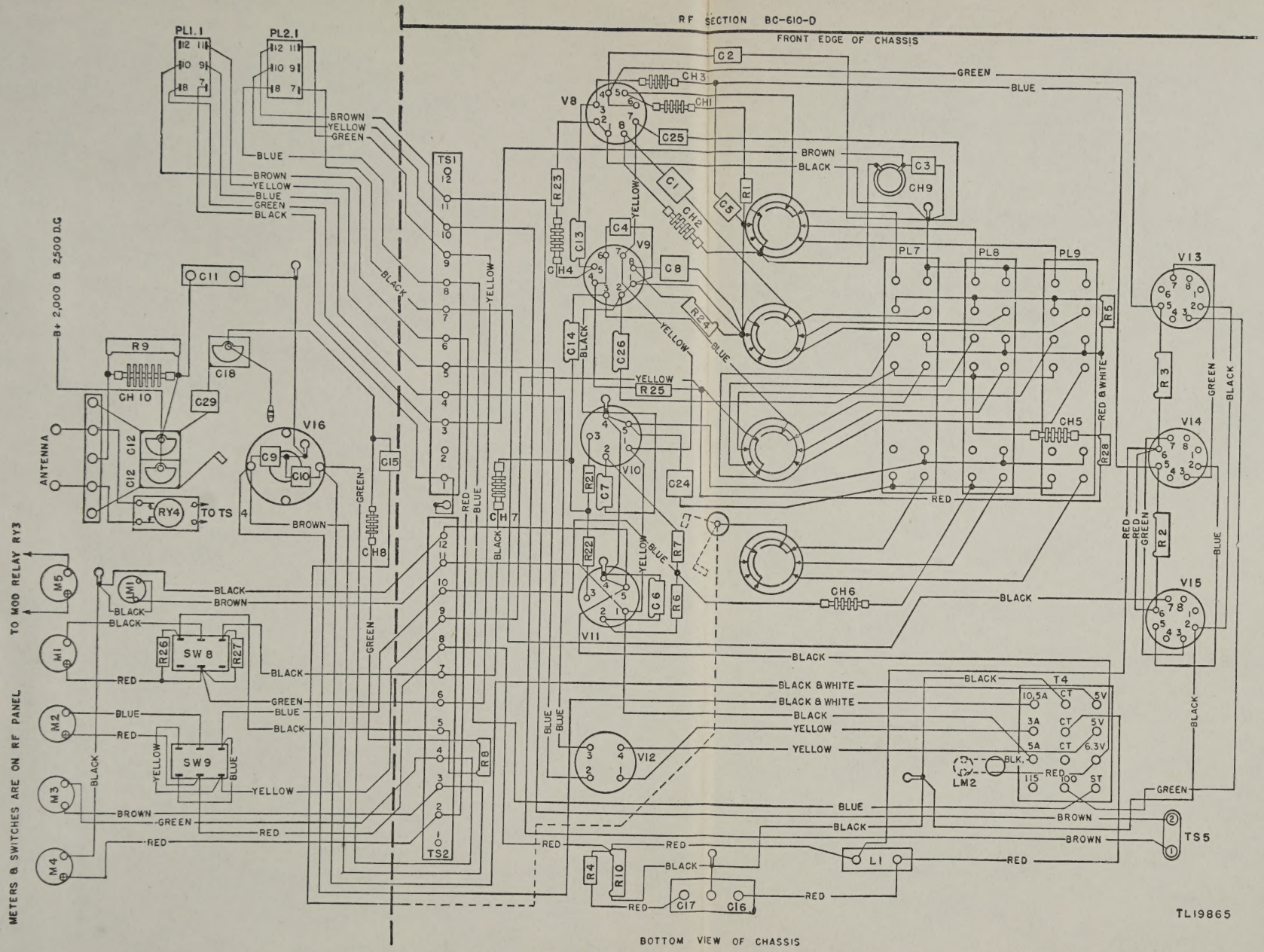
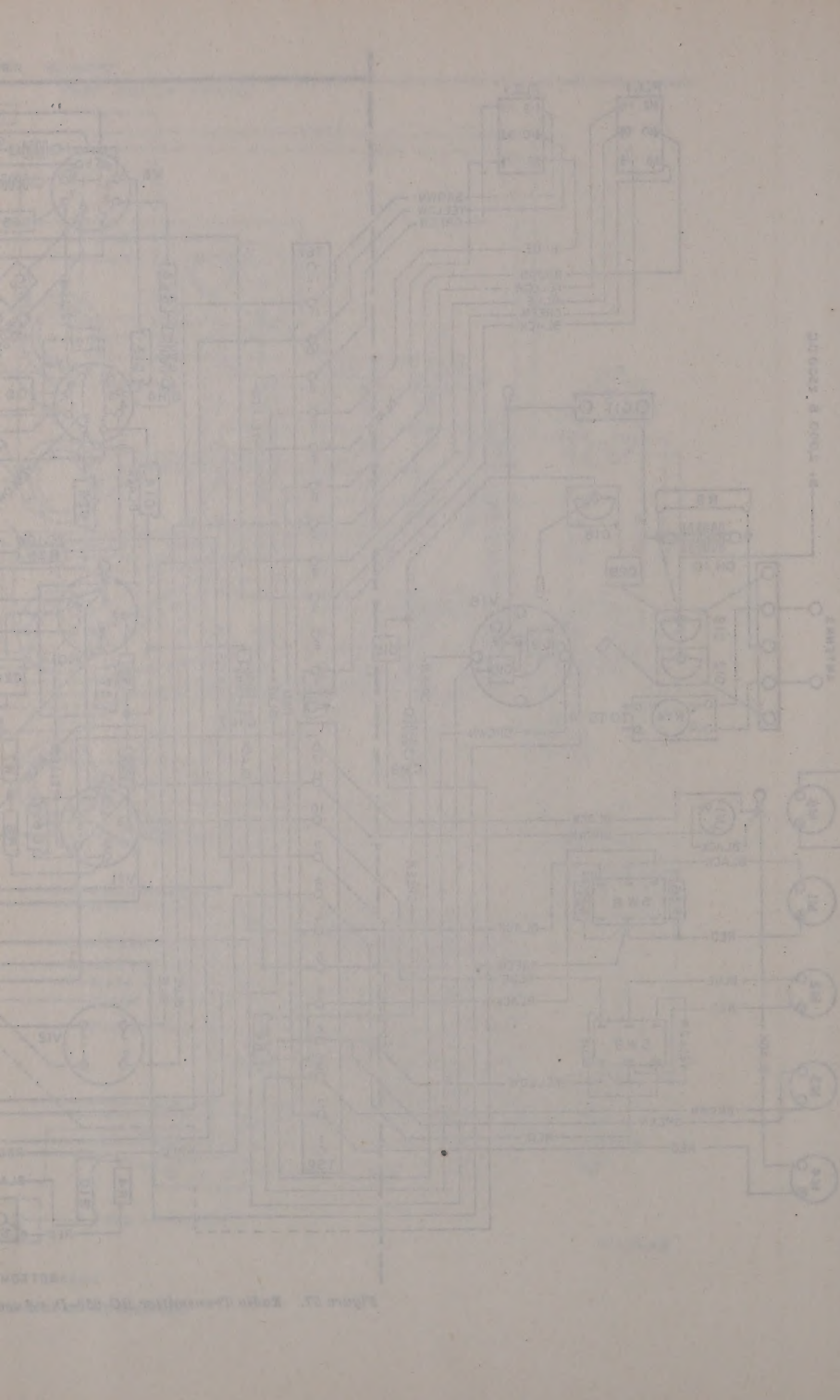
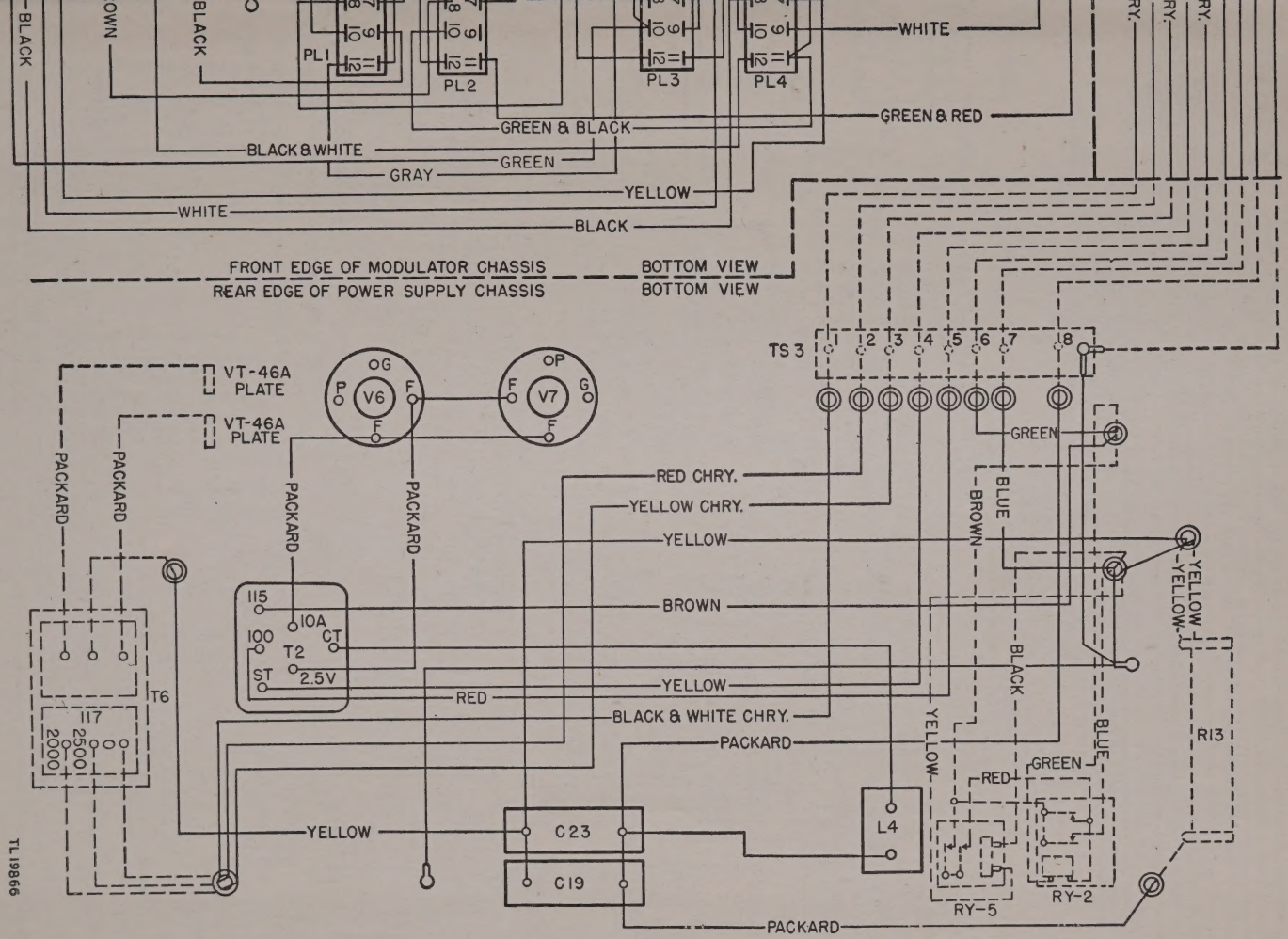


Figure 57. Radio Transmitter BC–610–D, r-f section, practical wiring diagram.





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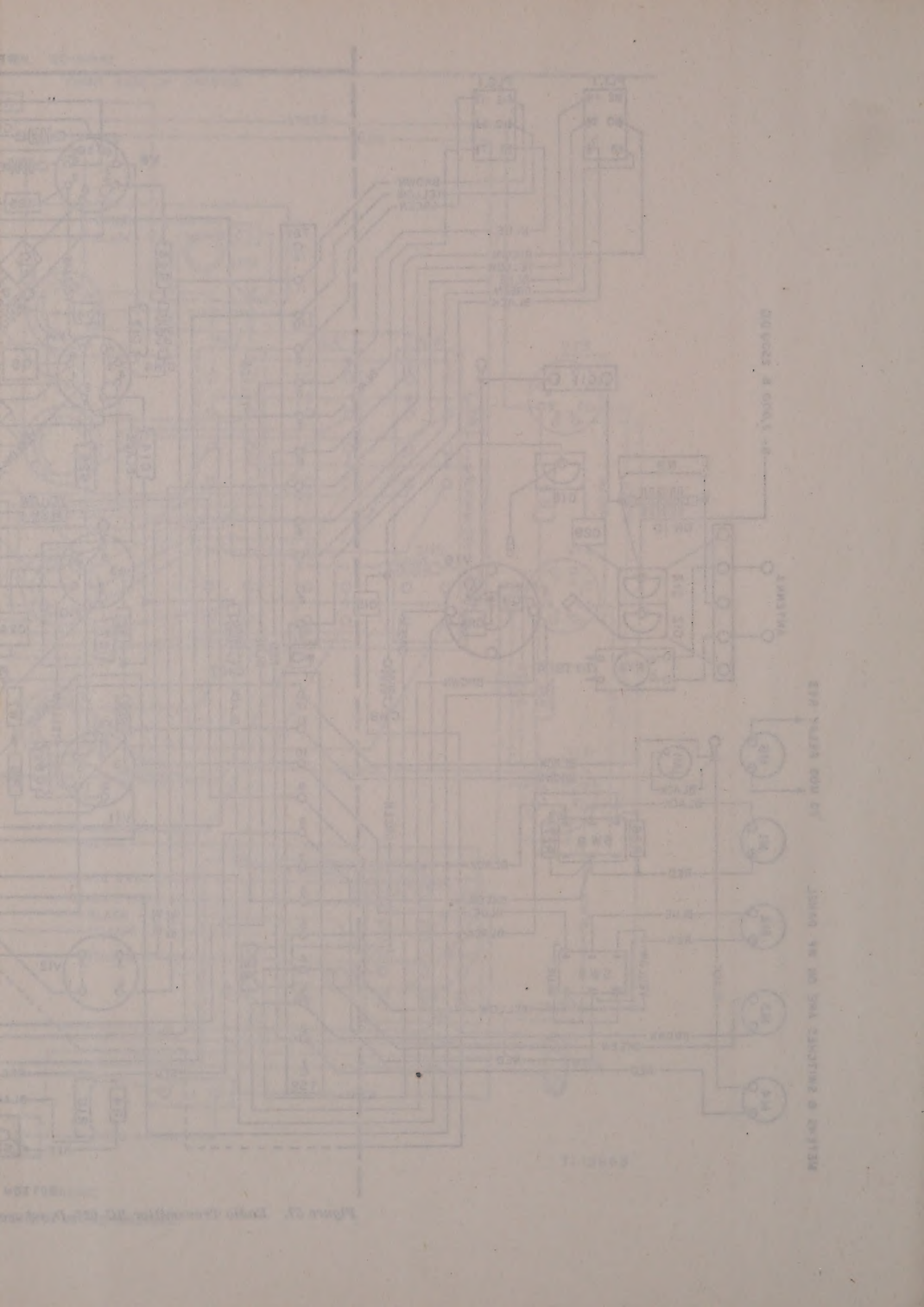
al wiring diagram.



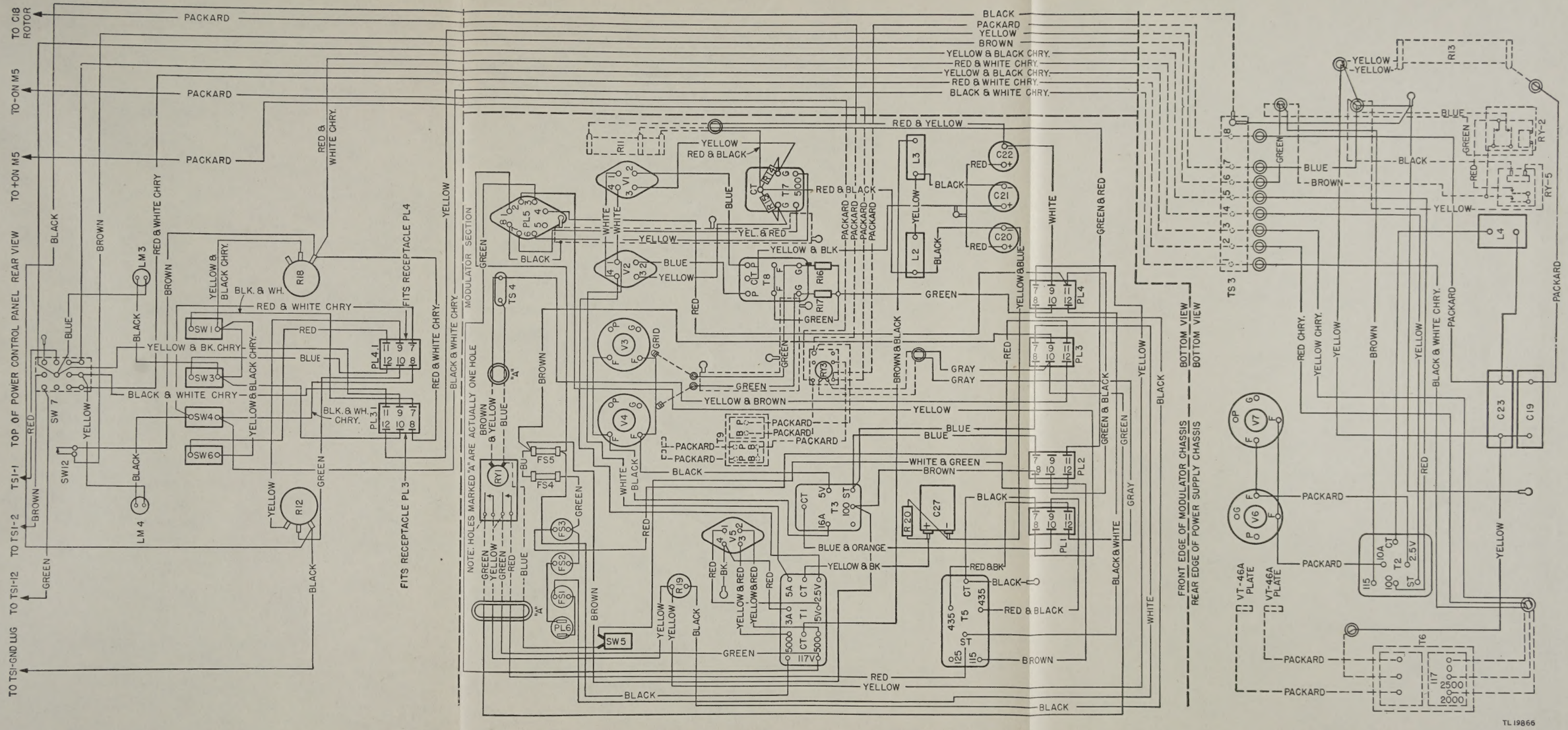
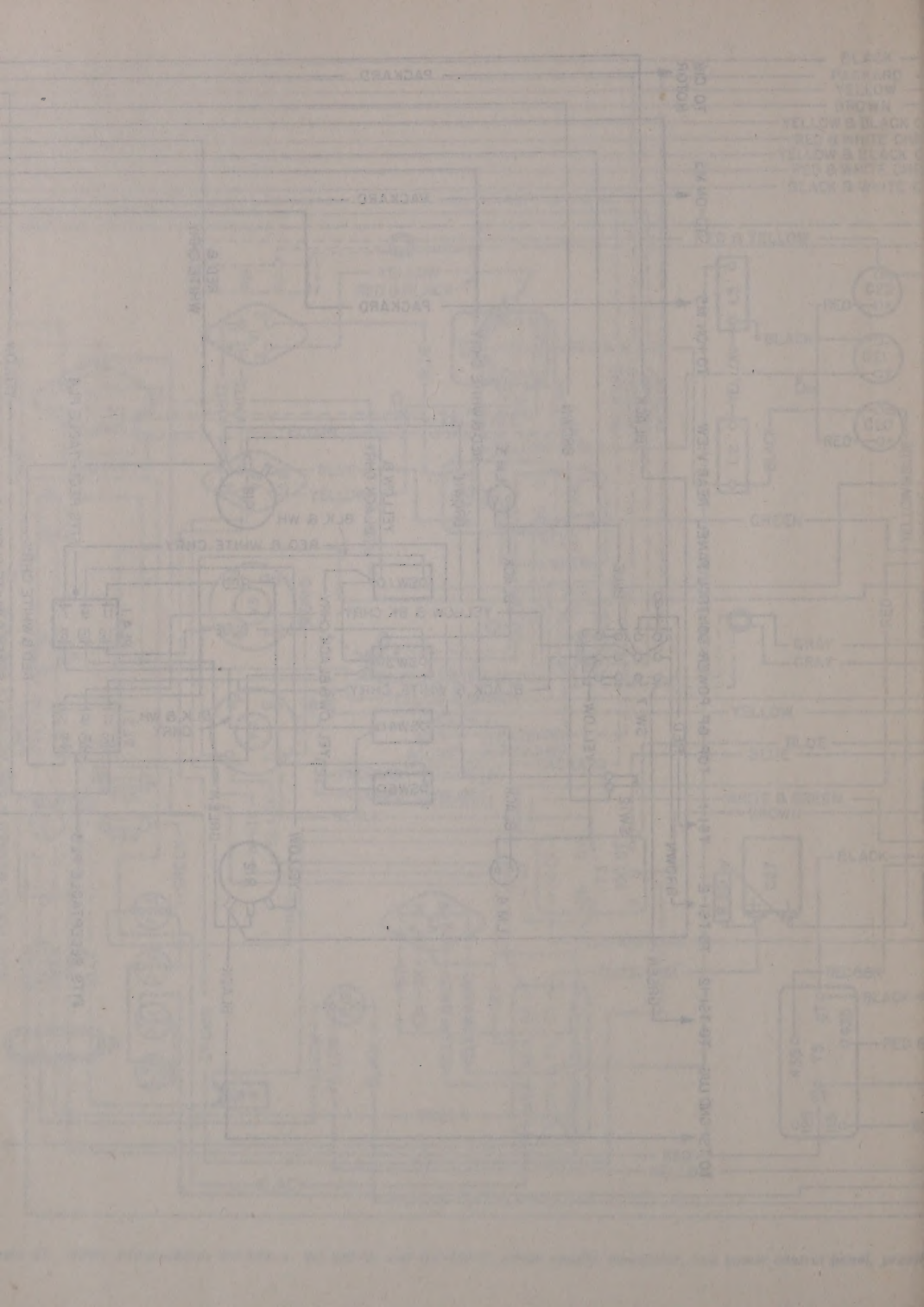
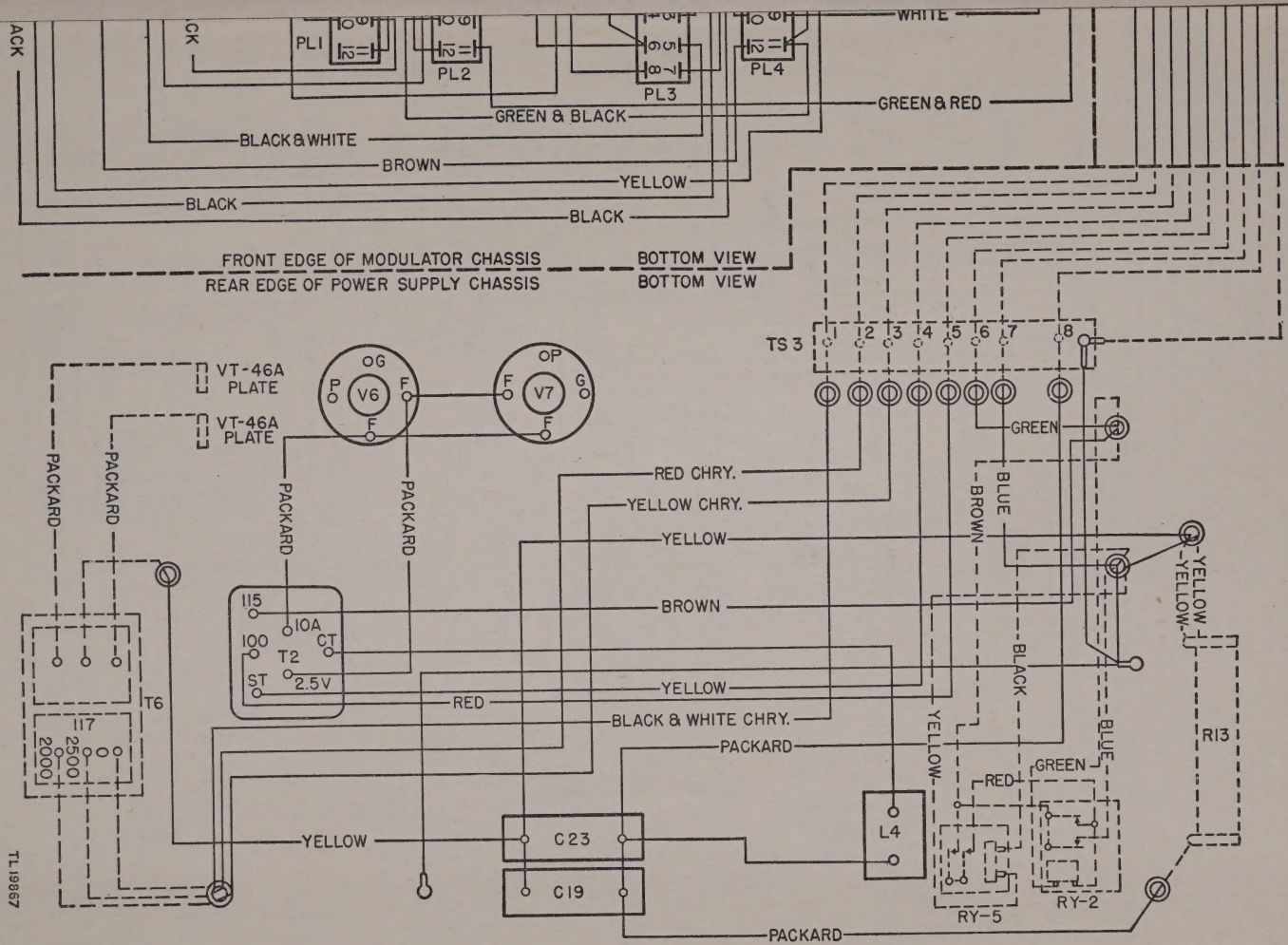


Figure 58. Radio Transmitters BC–610–A, BC–610–B, and BC–610–C, power supply, modulator, and power control panel, practical wiring diagram.





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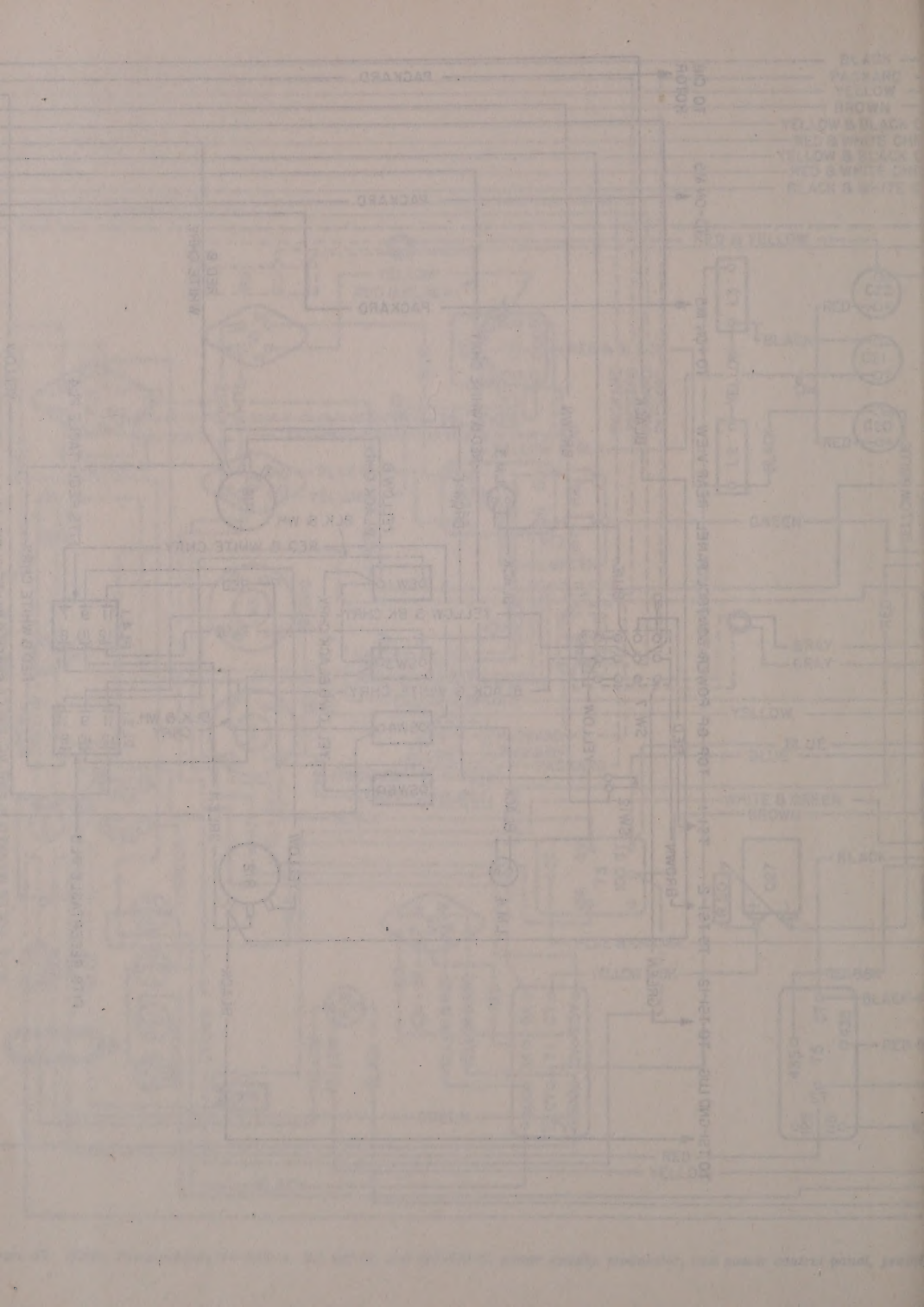


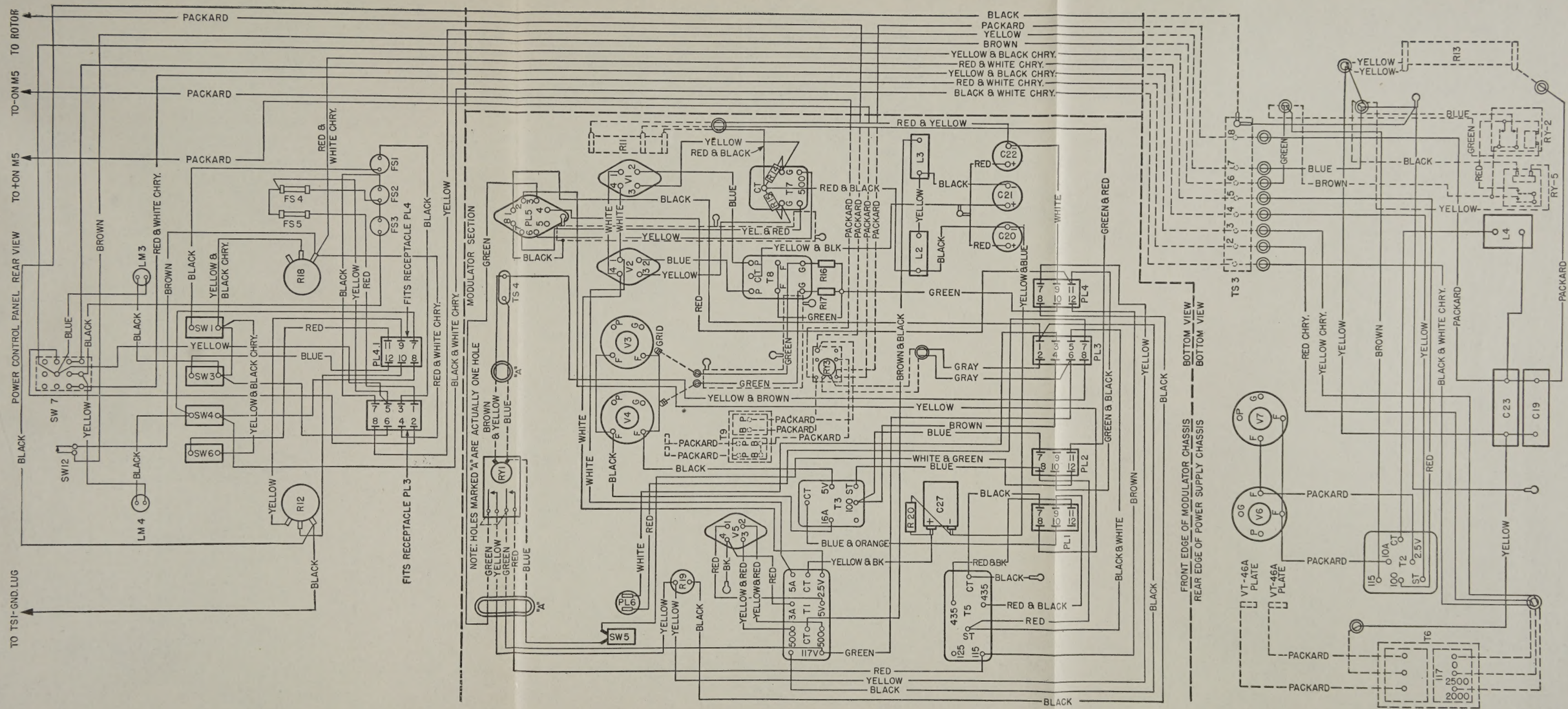
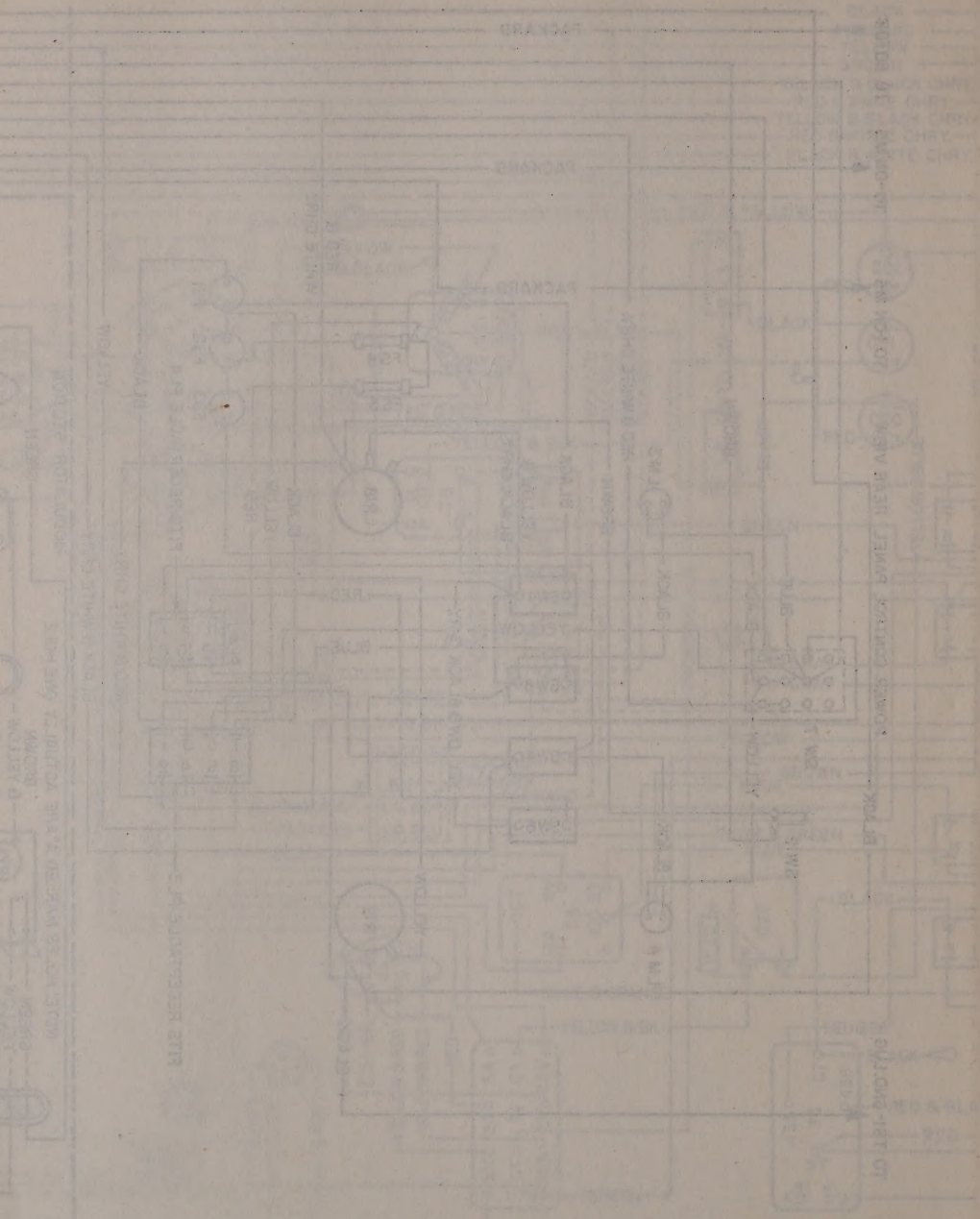


Figure 59. Radio Transmitter BC-610-D, power supply, modulator and power control panel, practical wiring diagram.

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